This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

11 Vols 12f

1817
ARTES
SCIENTIA
VERITAS
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
E PLURIBUS UNUM
TUEBOR
SI QUÆRIS PENINSULAM AMŒNAM
CIRCUMSPICE

h

C, b, l, l

i
.E97
180

EVENING AMUSEMENTS;

OR, THE

BEAUTY OF THE HEAVENS

DISPLAYED.

IN WHICH

SEVERAL STRIKING APPEARANCES,

TO BE OBSERVED ON VARIOUS EVENINGS IN THE

HEAVENS,

DURING THE YEAR

1804,

ARE DESCRIBED.

TO BE CONTINUED ANNUALLY.

By WILLIAM FREND, ESQ. M.A.

ACTUARY TO THE ROCK LIFE ASSURANCE COMPANY, AND LATE FELLOW
OF JESUS COLLEGE, CAMBRIDGE; AUTHOR OF PRINCIPLES
OF ALGEBRA, TANGIBLE ARITHMETIC, ESSAY
ON PATRIOTISM, ETC.

DOCENDO DISCO.

THIRD EDITION.

LONDON:
PRINTED FOR J. MAWMAN, N° 39, LUDGATE STREET.
1820.
Price 3s. boards.

RUSSELL
No.........................
INSTITUTION

EVENING AMUSEMENTS;

OR, THE

BEAUTY OF THE HEAVENS

DISPLAYED.

TO THE READER.

YOU have stood upon an eminence, and exulted in the surrounding prospect. Your heart has expanded with joy as the eye rested in succession on verdant fields, cultivated lands, shady groves, purling streams, the busy haunts of men, and the sequestered vale. Sordid self-interest was in these delightful moments banished from your breast: everywhere you discovered traces of that almighty hand, which gave existence to the world around you: you acknowledged the wisdom and the love of your heavenly Father; and thoughts derived from that Earth, to which we are so nearly allied, conducted you to sentiments, which are a proof of your own divine origin. Permit me to enlarge your views, and increase your pleasures. When the landscape fades from the sight, a new scene is opened to our view, and the starry heavens, with the Moon's sober light, attract our attention, and excite our admiration. You have looked up to the skies, and been lost in wonder at the glittering confusion; in every part the stars have appeared to you countless from their multitude: let me conduct you through this seeming labyrinth; and the order and regularity, which will be discovered in the motions of the heavenly bodies, will amply repay you for the slight degree of exertion necessary on your part to perceive the beauty of the system. I do not require much time, or much attention. An occasional look to the heavens in the evening will by degrees bring you acquainted with every brilliant orb, that deserves to be noted for its splendour, or the peculiarity of its motion: and, when we have satisfied our curiosity with the objects, that nightly present themselves to our view, another world shall excite our admiration; and new pleasures will be derived from that power, which enables us to penetrate into the remote regions of space.

JANUARY, 1804.

I TRUST, that you will not be discouraged by one or two hard words, derived from the languages of those nations, which have cultivated astronomy with great success. I shall make use of as few as possible; for in this and every other science I should be glad if every word was familiar to the English ear. I will suppose you then on an eminence at noon, your prospect being bounded by a line, where the Heavens and the Earth seem to meet each other. This line is called the horizon, or bounder, because it bounds our prospect. The rising and setting Suns form always a beautiful object on this line; and in this situation they present to a young person a good opportunity of correcting his first ideas, and shewing him, that the Sun is a much greater body than it appears to be. For, if the Sun sets behind a tree of some magnitude, and at a distance from the observer, he will perceive, that the tree does not appear so high as the distance between the upper and lower rim of the Sun, and he must then be satisfied, that the Sun is greater than the tree. Farther experience will teach him, how inadequate the idea is, that he can form of the Sun, either by the eyesight, or any assistance yet afforded to it by human ingenuity.

But I supposed you to be on an eminence at noon. In this country the Sun is never directly over your head; if he were, we should say, that he was in the zenith, meaning by the word zenith the point directly over your head. To look at the Sun, your face at noon must always be in this country in the same direction; and it is not difficult to conceive a line drawn from the point directly over your head through the Sun, and continued till it meets the horizon. The point where this line cuts the horizon is called the south point; and the line, drawn from this point directly under the place on which you stand, till it meets the horizon again, is called the north point. Thus, when you look towards the Sun at noon, your face is to the south, and the back part of your head to the north. Now stretch out your arms, and suppose a line drawn under your feet in the same direction, till it meets the horizon both ways; and the two points, in which it cuts the horizon, are called the east and the west points; the east being the point to the left, and the west the point on the right hand. If you change your position, with the arms still extended, and your face is to the north, then the back of your head is to the south: the right hand points to the east, and the left hand to the west. If you face the east, then the right hand points to the south, the left hand to the north, and the back of the head is to the west. If you face the west, then the right hand points to the north, the left hand to the south, and the back of the head is to the east. It is very useful to teach this to children, and to exercise them frequently in this manner. They will soon acquire clear ideas on a subject, perplexing to numbers, who have enjoyed what are called the benefits of a good education. The line in the heavens, which may be supposed to pass through the south point, the Sun at noon, the zenith, and the north point, is called the meridian, or middle day line; the word meridian being derived from two words in the Latin, meaning the middle of the day. The heavens are thus divided into two parts by the meridian, the one being called the eastern part, the other the western part.

Our measures upon land are for length, taken from our feet; and from a straight line, one foot in length, we make yards and miles. For the heavens a different measure is used, and this is taken from the arc of a circle. Suppose the middle day line to be divided into two equal parts; then, since the line itself is the half of a circle, each part will be the quarter of a circle. This quarter of a circle may be supposed to be divided into ninety equal parts; and then each part is called a degree; or, in other words, a degree is the three hundred and sixtieth part of a great circle in the heavens. All distances are measured by degrees, and we may form a sufficiently accurate idea of a degree by means of the Moon, whose diameter, or line passing through the centre of the face, and bounded by the edges, is about half a degree in length, being sometimes more and sometimes less. But then, to have this idea correct, we must look at the Moon when it is near the middle day line. By a few observations we shall still more improve this idea, till, from the number of degrees specified, we shall have a good notion of the length of the arc between two objects. The degree is divided into sixty parts, called minutes.

We become acquainted with a country or town by excursions in different directions, and fixing in our memory the situation of places most worthy of notice. We cannot travel from star to star, but there are bodies which move round the circuit of heaven; and, by noting their course, we may distinguish the principal stars, to which they are approaching, or from which they are retiring. The Moon is the chief of these bodies: it performs its circuit in the course of a month, and its path is now so well marked out, that we can with ease discover by its means the places of various objects worthy of our attention. The Moon then shall be our first guide, and we will begin our observations of her at a point, near which are some objects easily to be distinguished. The former part of this month is not favourable to our purpose; the reasons will be easily seen hereafter; and on this account I shall not call your particular attention to the Moon till the 19th, when she will be seen at Sun-set in the eastern part of the heavens, and to the north-east of her, at the distance of about eight degrees, will be seen two small bright stars, and a little farther off a larger star, which deserve attention. The brightest is the first star in the constellation called the Ram; the two next are the second and third stars in that constellation; the second being the nearest to the first. You cannot fail of distinguishing with great ease these stars at half past five, as the Moon will then be on the meridian line, and the two smaller stars very nearly on the same line; the lowest of them being about ten diameters of the Moon distant from her. From the third star the second is about three diameters of the Moon distant, and the first star is about eleven diameters of the Moon distant, being nearly to the east of the second star.

On the 20th, at Sun-set, the Moon will be seen in the eastern part of the heavens, the first star in the Ram being to the west of her, and nearly on the meridian line. The distance at this time between the Moon and this first star is about seven degrees. At twenty minutes past six the Moon will be on the meridian, and consequently the three stars of the Ram in the western part of the heavens. Having thus distinguished the three stars of the Ram, you will do well to look at them and the Moon two or three times before nine o'clock, that their form may be preserved in your memory, and you will be able to discover them without the Moon's assistance.

On the 21st, the Moon will be seen at Sun-set in the eastern part of the heavens, and to have travelled a considerable distance from the the three stars in the Ram; of which the first will be upon the meridian about six. At this time our attention is called to a beautiful collection of stars to the east of the Moon, and about three degrees distant from her. These stars are called the Pleiades; of which it is recorded, that they were formerly seven stars, but now there are only six. At about a quarter past seven the Moon will be on the meridian, the Pleiades, of course, to the east of her; but a discerning eye may perceive, that she has approached nearer to them; and at three minutes past ten she will have approached to within about a degree of that which is called the seventh star of the Pleiades.

On the 22d, at Sun-set, the Moon will be seen in the eastern part of the heavens, the Pleiades being now to the west of her. They will be upon the meridian at about half past seven, when our attention is caught by a very large bright star below the Moon, with a cluster of small stars about him. This is a star of the first magnitude, and is called Aldebaran, the Bull's eye, or the first star in the constellation called the Bull. The small stars around him are called the Hyades. The best time for distinguishing this star is about a quarter past eight o'clock, when he will be upon the meridian, together with the Moon, the distance between them being about ten degrees, the star being below the Moon. The Pleiades and the Ram are at this time in the western part of the heavens, and the Ram is nearly half way between the meridian and the horizon.

On the 23d, at Sun-set, the Moon appears in the eastern part of the heavens, and near to it a bright star, which is the second star in the Bull, being between one and two degrees to the north-west of her. At half past five the three stars in the Ram are on the meridian, at a quarter past seven the Pleiades are on the meridian, at eight Aldebaran, and at a quarter past nine the Moon, when the most beautiful constellation in the heavens is to be discovered also on the meridian, and the observer will be gratified with an effulgence, with which the most brilliant collection of diamonds bears no comparison. Carry your eye down from the Moon, in the direction of the meridian, about twenty-six degrees, and three bright stars in a line, at the distance of about a degree between the two adjacent ones, will arrest your attention. These three stars now cross the meridian line in the direction nearly from south-east to north-west, and below them are three more stars of smaller magnitude, in the direction of the meridian. The first three stars are called the belt, the three smaller stars are called the sword of Orion; the constellation, to which they belong, taking its name from a fabulous hero of ancient times. In the meridian, about ten degrees above the first star in the belt, are three small stars, which are in the head of Orion, and about five degrees to the south-east of these three stars is a star brighter than any other star in this constellation, which is the first star of Orion, or the star in his right shoulder; and about four degrees to the south-west is the third star of Orion, or the star in his left shoulder. About nine degrees to the south-west of the middle star in the belt, is the second star of Orion, or star in his left foot. When your curiosity is sufficiently gratified with the singular position and beauty of the belt and sword, and brightness of the first, second, and third stars of Orion, an effulgence, to the south-east of the belt, and about twenty-three degrees from the middle star of the belt, cannot fail of striking you with wonder and pleasure. This is the most brilliant of the fixed stars, and is called Sirius, or the first star of the Great Dog. At present its position and brilliancy, hereafter its history, will excite your attention.

On the 24th, at Sun-set, the Moon will be seen in the eastern part of the heavens, having removed considerably from the second star of the Bull, and appearing to approach two bright stars to the north-east of her, called Castor and Pollux, or the first and second of the Twins. The first star of the Ram is upon the meridian at about half past five; the Pleiades at a quarter past seven; Aldebaran at eight; the belt of Orion at nine; and, by reading over the account of the preceding day, you have now opportunity again of admiring this constellation, and fixing in your memory the position of its principal stars. At twenty-four minutes past six the Moon will be seen at its nearest distance from a small star, which is called the fifth of the Twins, the distance being a little more than a degree, and the star is to the south of the Moon.

On the 25th, at Sun-set, the Moon will be seen in the eastern part of the heavens, and at a considerable distance from the small star, the fifth in the Twins, to which it was so near the preceding evening: and, at twenty-seven minutes past six, a small star, the tenth of the Twins, is very near to its southern rim. To the north of the Moon the first and second stars of the Twins may now be easily distinguished, the second being between five and six degrees from her to the north, and the first being between four and five degrees higher up in the heaven from the second. The first star in the Ram is on the meridian about thirty-five minutes past five: the Pleiades about a quarter past seven: Aldebaran at eight: the middle of the belt of Orion about nine.

On the 26th, an appearance takes place, which once terrified our ancestors, and affords still, among ignorant nations, occasion for dismay. The Moon on this day passes through a part of the heavens, which is deprived of the light of the Sun by the interposition of the Earth. As only a part of the Moon passes through the shadow of the Earth, the eclipse is partial. It begins at fifty-seven minutes past seven in the evening, and ends at sixteen minutes past ten. The south limb of the Moon only is affected. In the intervals of observing the gradual effect of the Earth's shadow on the Moon, the following objects will deserve your notice. At the beginning of the eclipse Aldebaran is on the meridian, the Pleiades about eleven degrees distant from the meridian in the western part of the heavens, and the first star of the Ram also in the western part, about thirty-six degrees from the meridian. At the middle of the eclipse, or seven minutes past nine, Orion is on the meridian. Sirius, or the Dog star, is in the eastern part of the heavens, shining with majestic splendour; and, if with the eye you draw a line from the Moon to Sirius, a little to the west of that line, and almost half way from the Moon, a bright star will strike you. This is called the Lesser Dog star; and near to it to the west is another star of inferior splendour, which is the second in the constellation called the Lesser Dog. At the close of the eclipse Sirius will be seen in the western part of the heavens, but very near to the meridian; the Lesser Dog star, and the two first stars of the Twins, being in the eastern, and at no great distance from the meridian. The little star, seen at the close of the eclipse very near to the Moon's southern limb, is the fourth star in the constellation called the Crab; and deserves remark, as it is in the path described by the Earth, or the circle called the equator.

On the 27th, at Sun-set, the Moon is below the horizon; and we may now exercise our attention upon those stars which we have discovered by its assistance. The first star of the Ram, as soon as the twilight will permit its rays to have effect, is seen upon the meridian, and the Dog star has just arisen, and will be discovered by looking towards the south-east: the eastern part of the heavens exhibiting now a very splendid appearance, from the brilliancy of the Pleiades, Aldebaran, and Orion; with whose form it is presumed that you are at this time tolerably well acquainted. The Pleiades pass the meridian at seven: Aldebaran a little before eight: the second star of the Bull, and the middle star of the belt of Orion, at a quarter before nine; and Sirius a little before ten: and these directions will serve for the discovery of these stars to the end of the month. At nine o'clock the Moon will direct us to a star of the first magnitude, at the distance of eleven degrees east of her. This star is called the Lion's heart, or the first star in the constellation called the Lion.

On the 28th, the Moon gives us a farther opportunity of distinguishing the Lion's Heart, as this star is seen, as soon as the Moon is visible, a little to the west of her. At six o'clock this distance does not amount to three degrees and a half; and as for the remaining days of this month, the Moon does not afford us, within our limits, the desired opportunities of discovering other stars, we will, with gratitude for the assistance already bestowed, wait till she has passed the Sun, and returns to us with reviving splendour.

FEBRUARY, 1804.

IF the preceding month presented to you many cloudless skies, I may presume, that you can tell the position of several stars, and carry your eye, with tolerable ease, from one object to another. The meridian, or middle day line, is, you have perceived, of great importance: and we have not required for our observations more than a southern window, not overlooked by the opposite houses. By accustoming yourself to notice the Sun at noon, you will gain a clear notion of the south and north points; the south point being, as I have before observed, the point in the horizon directly before your face; the north point, that directly behind your back. But, to make this idea still clearer and more familiar, let me prevail upon you to make a circle with a pen between your fingers. It is an easy mode, and the circle will, with little practice, be as accurate as one drawn with a pair of compasses. Place the pen between your middle and fore fingers, the pen resting on the first joint of the middle finger, and being kept firm by the first joint of the fore finger, and pressed by the thumb, so that the other part may rest on the third joint of the fore finger. Then fix the second knuckle of the middle finger firm on your paper; bring the knib of the pen close down on the paper, and with your left hand turn the paper round the knuckle that is fixed upon the paper. Your pen will mark out a complete circle. In this circle make a mark to determine the north point, and write over it N, for north; and directly opposite to this point make another mark, and write underneath it S, for south. Between the points N and S in the arc, find the middle point, and write near it E, for east; and opposite to this latter point make another point, writing near it W, for west. You will now clearly conceive, that, if your eye were placed in the middle of this circle, with the face to the north, then the back of the head would be to the south, the right hand to the east, and the left hand to the west. With this circle the other positions may be considered, which are mentioned in the fourth and fifth pages. These are called the four cardinal points: but you have already seen, that these four points would not be sufficient to point out to us the situation of various objects; we are therefore led to the use of four more, which are thus found. Between the points N and E in the circle, take a middle point, and write near it N E, and the point thus found denotes the north-east, or point exactly between the north and east points. Opposite to the point thus found make another, and write near it S W, to denote the south-west point, because it is exactly between the south and west points. In the same manner, between N and W find a middle point, and write near it N W, to denote the north-west point; and directly opposite make another point, and write S E, to denote the south-east point. Thus, when we are told to look to the north-east, we direct our face first to the north, and then turning a little, we stretch out the right hand to a point exactly between the north and east points; and so of the other points, N W, S W, S E, the first letter denoting to which quarter you should look, the second to which point you should turn your face half way. A little practice will make all this very familiar to you, and you will then find no difficulty in understanding the conversation of our brave sailers, to whom every one of us is so much indebted.

The Moon does not come to our assistance till nearly the middle of this month, but her absence is supplied by a beautiful orb, which makes its appearance in the west soon after Sun-set, and is to be distinguished from the other stars, when they do appear, not only by its superior lustre, but by the nature of its light. This orb does not twinkle like the other stars, nor does it preserve with respect to them the same position: for during this month it will move in the direction from west to east nearly thirty degrees. Hence this is called a planet, or wandering star, from a Greek word of the same import: and we are of course called upon to make a distinction in the heavenly bodies, denoting them by the names of fixed stars and planets; others will be found hereafter, whose nature shall be explained as opportunity offers. This orb takes its name from one of the idle fictions of the heathen mythology, and was called by the ancients Venus, or the goddess of beauty; to moderns it is known by the names of the morning star, or the evening star, as in the evening it is at certain times the first star that is seen after Sun-set, and in the morning the last star that disappears before Sun-rise: we shall have occasion hereafter to mention many other peculiarities of this beautiful orb.

We must be content this month with admiring the brilliancy of the evening star by itself, as it does not direct us to any very brilliant stars in its neighbourhood. The small stars near it are inconsiderable stars in Aquarius, or the Water-bearer; the bright one about seven degrees below it is the fourth star in the Water-bearer. We may now form some idea of the Earth's path in the heavens. Venus is not quite a degree and a half to the south of it, and at six o'clock we may carry our eye from her to the three stars in the Ram, which are in the western part and near the meridian, and the first star is between nine and ten degrees north of the Earth's path. The Bull's eye is in the eastern part, and is between five and six degrees south of the Earth's path; and farther to the east are the Twins, the second of which is between six and seven degrees north of the Earth's path. By accustoming yourself to carry your eye thus from one star to another, you will form a very good idea of the motion of the Earth, which moves about a degree more or less every day in this path. At half past eight o'clock Orion will be upon the meridian: the three stars of the Ram, the Pleiades, Aldebaran, and the second star of the Bull in the western part of the heavens; Sirius, the Lesser Dog star, the Twins, and the Lion's heart, in the eastern part of the heavens. This beautiful appearance will remain nearly the same during the whole month, except that Orion comes later to the meridian every night, and Venus will be perceived to have changed her situation very considerably. On the 6th, she will be seen very near a small star, which is the twenty-first of the Water-bearer, the star being only between seventeen and eighteen minutes to the north of her; and by means of this star you may perceive the nature of her motion, as she appears to move from it at the rate of about a degree every day.

On the 11th, the eclipse of the Sun gives us the good tidings, that we shall soon be favoured with the appearance of our monthly guide. The Moon on this day passes between the Earth and the Sun, and deprives us of part of the light which we derive from the Sun. The eclipse begins at twenty-seven minutes past ten in the morning, and ends at fifty-five minutes past twelve. The Moon makes the first impression on the Sun's limb on the right hand, towards the lower part of the Sun's disc, being at the distance of one sixth part of its circumference from the lowest part of the disc.

On the 15th, we may begin our observations again on the Moon's motion. At forty-one minutes past seven, we shall see her very near to a small star, which is the seventh of the constellation called the Fishes, being only about half a degree to the south of this star. At this time she is about six degrees from the third star of the Ram; and carrying our eyes upwards we perceive the two other stars of the Ram; the Pleiades and the Bull's eye are in the western part of the heavens, and Orion is on the meridian. A little before nine Sirius, or the Great Dog star, is on the meridian. The first and second stars of the Twins are in the eastern part of the heavens, and very near the meridian; below them two stars, resembling them very much, the greatest being the first, and the other the second of the constellation called the Lesser Dog. Half way nearly between the zenith and the horizon is the Lion's heart, and we must look to the south of the east for it.

On the 16th, the Moon will be seen to have passed the three stars of the Ram, being about five degrees only from the first or brighest of these stars.

On the 17th, she will be seen to have increased her distance very considerably from the three stars of the Ram, and to be approaching towards the Pleiades, whom she will pass in the morning of the 18th, and of course at night she will be seen to the east of them. At eight minutes past six she will be seen on the meridian, the Pleiades to the west of her, the Bull's eye near to the meridian, but about ten degrees below her, and having around it the cluster, which you remember are called the Hyades.

On the 19th, at a quarter past six, the Moon will be seen to the south, of a bright star, and about half a degree distant from it. The star, you may remember, is the second of the Bull. At eight minutes past seven she is on the meridian, when the aspect of the heavens is remarkably beautiful; in the western part, Venus just setting; the Ram, about half way up; the Pleiades, Hyades, and Aldebaran near to the meridian; the second star of Orion in the west also, and having just passed the meridian; the third star in the shoulder is on the meridian; the stars in the belt and sword are in the eastern part, but touching the meridian. Sirius, the two stars in the Lesser Dog, and the two stars in the Twins, call our attention in the eastern part of the heavens.

On the 20th, the Moon is on the meridian at eight minutes past eight; and the star about ten degrees below it, and near to the meridian in the east, is the third star in the Twins. Carrying the eye down the meridian still farther, a little to the east of it, we are gladdened with the splendour of Sirius. The view of the heavens to the south is now remarkably beautiful; the Moon being in the meridian, in the western part of the heavens are Orion, Aldebaran, the Pleiades, and the three stars of the Ram; in the eastern part Sirius, the Lesser Dog star, the three stars in the Twins, and to the east of the Moon, in midheaven, the heart of the Lion. To the north-east of the Moon must clearly be distinguished the two stars of the Twins; and to the south of her, and very near the meridian, the third star of the Twins.

On the 21st, at Sun-set, the Moon will be seen to have approached nearer to the two stars in the Twins, which now cannot fail of being clearly distinguished in a cloudless sky, as the lowest of these stars will then be within six degrees of her, and there are no stars for a great distance equal to them in brightness. At five minutes past nine she is on the meridian, at which time the first star in the Twins will be also in the meridian with her, and the second below the first, and a little to the east of the meridian. By carrying the eye down the meridian from the Moon, a little to the east of the meridian, the Lesser Dog star will strike our attention; and still lower in the western part, but near to the meridian, Sirius will shine, notwithstanding the Moon's light, with great splendour. Orion is now seen in the western part of the heavens.

On the 22d, the Moon will be perceived to have removed considerably from the two stars in the Twins, which will now seem to be almost in a line with her. At seven the aspect of the heavens in the south is very beautiful, as Orion is on the meridian; and very near to the zenith, in the western part of the heavens, is a star of the first magnitude, the first of the Waggoner, known by the name of Capella, or his Goat: Venus, the Ram, the Pleiades, and Aldebaran in the western; the Twins, the Lesser Dog star, and Sirius in the eastern part of the heavens. At about half past eight Sirius will be on the meridian, and near to the meridian also the Twins, and the two stars in the Lesser Dog. To the east of the Moon we shall perceive the Lion's heart, to which she is approaching.

On the 23d, at Sun-set, Venus in the western part, Sirius, the Moon, and the Lion's heart, may fix our attention, as soon as they can disengage themselves from the Sun's rays. The Moon will be seen to have been approaching to the Lion's heart, to which star, on the 24th, she will be very near, as in the afternoon she passes by a small star within three degrees of the Lion's heart: this star is the thirteenth of the Lion. Soon after Sun-set the Moon will be seen near to these two stars, forming a triangle with them, the brightest being the Lion's heart, which cannot now fail of being known, as the Moon will pass it this night, at the distance of little more than a degree. On the 25th, the Moon will be seen considerably to the east of the Lion's heart; and as for the following nights of this month she will not rise till after Sun-set, we will conclude this month with a general picture of the heavens, which may please the observer about six and nine o'clock. At six, in the western part of the heavens we shall admire the splendour of Venus, the three stars in the Ram, the Pleiades, and Hyades; Aldebaran is in the meridian; near to the zenith in the eastern part is Capella, and in the same part Orion, Sirius, the Lesser Dog, the Twins, and the Lion's heart. At nine o'clock Venus is no longer visible; the three stars in the Ram are near the horizon; the Pleiades, Aldebaran, Orion, Sirius, and Capella, are in the western part of the heavens. The first star of the Lesser Dog is in the meridian, the second star in the west; above them the two stars of the Twins, the second upon the meridian, the first in the western part of the heavens. The two stars of each cannot in this situation fail of being distinguished, as the lines connecting each pair seem to be parallel. In the eastern part is seen the Lion's heart, about midheaven.

MARCH, 1804.

I PRESUME, that my reader is tolerably familiarized with my plan, and if several evenings have been unfavourable, yet there have been sufficient opportunities for distinguishing some of the most brilliant fixed stars. Every step we take will now serve to make our ideas clearer; but previously I would wish you to accustom yourself to draw imaginary lines with your hand, from the zenith to different points in the horizon. You are acquainted with eight points; we may now increase the number, as it will serve us to determine with more ease the position of the heavenly bodies. Make as before a circle with your pen, and divide it first into four parts; then divide the distance equally between the two nearest points, and thus place the eight points in their order: north, north-east, east, south-east, south, south-west, west, north-west. Now divide the distance equally between each two adjacent points, and eight points more will be added to your number. The mode of naming them may at first appear singular, but it is easily learned, and is very ingenious. The point between the north and north-east is called north-north-east; the first word, north, denoting that you are to look to the north; the next words, north-east, denoting, that the right hand is to be moved towards the north-east, and stopped in the midway between north and north-east. Between east and north-east find the middle point, and write near it E N E, denoting east-north-east, or point between the east and the north-east. In the same manner between east and south-east write E S E, for east-south-east. Between south-east and south write S S E, for south-south-east: between south and south-west write S S W, for south-south-west: between south-west and west write W S W, for west-south-west: between west and north-west write W N W, for west-north-west: between north-west and north write N N W, for north-north-west. Young persons may be much amused in a winter's evening, by making circles in the manner above mentioned, and marking the points with the eye, as exactly as they can. In a short time they will do this with great ease, and thus acquire clear ideas of the divisions of the circle, and be prepared for higher amusements. In the fields they should accustom themselves now to draw lines, from the zenith to these points in the horizon, which they have learned, and thus they will be able to determine with great ease the position of objects on the ground, as well as those in the sky.

For the first part of this month, till the Moon begins again to be our guide, we may fix our attention on Venus, and amuse ourselves with those stars, whose positions have been already determined. Soon after Sun-set, Venus will be seen in the west, and when it is sufficiently dark three small stars will be discovered near to her, to which she is approaching. These three stars are the fourth, fifth, and sixth in the constellation called the Fishes. On the 4th day she will be very near the sixth or least of these stars, as she passes this star at the distance only of three minutes and a half of it, or one fortieth of a degree, the star being to the north. Each successive day she will be seen increasing her distance from this star, and approaching the three stars of the Ram. On the 7th, at half past seven in the evening, Sirius and the third star of the Twins are seen on the meridian; the three stars of the Ram, the Pleiades, Hyades, Aldebaran, Orion, and Capella in the western part of the heavens; Capella being, when it is first seen in the evening, very near to the zenith. In the eastern part of the heavens are the two first stars of the Lesser Dog, the two first stars of the Twins, and the Lion's heart. This appearance will be nearly the same every night; if you look earlier, Orion will be nearly on the meridian; if later, Sirius will have passed it: and now you are requested to look particularly at Capella, and observe its progress at different intervals. From his superior brightness and nearness to the zenith, when he is first visible, you cannot fail of distinguishing him; and by looking at him, so as to have an idea of his path, you will perceive, that it differs from that of the other stars, which have hitherto been selected for our observation.

On the 15th, we may resume our journey with the Moon, in whose neighbourhood we shall recognize the Pleiades, whom she will have passed before the next evening. The group of stars around the Moon is at seven o'clock very beautiful; to the west Venus, over which are the three stars of the Ram; to the east of the Moon the Pleiades and Capella above; to the south-east Aldebaran and the Hyades; farther east Orion; and Sirius is on the meridian.

On the 16th, the Moon will be seen to the east of the Pleiades, and having Aldebaran to the south-east of her. On the 17th, she will be seen approaching to the second star of the Bull, which she passes at fifty-six minutes past eleven. On the 18th, she will be seen to the east of the second star of the Bull, and moving towards the Twins. On the 19th, she will be seen on the meridian, at seven minutes past seven, the two stars of the Twins being near to her, but above her; the first being very near to the meridian. Venus is now near to the horizon in the west, and near to her to the north the three stars of the Ram. If we now draw a line from the Moon to Venus, we shall perceive, on the north side of this line, the three stars of the Ram, the Pleiades, the second star of the Bull, and Capella; on the south side of this line, the Hyades and Aldebaran, Orion, the third star of the Twins, and Sirius. In the eastern part of the heavens are the two stars of the Twins, and the two stars of the Lesser Dog near the meridian; and in mid-heaven the Lion's heart. At half past eight in the evening look to the east-south-east, and about fifteen degrees above the horizon you will perceive a star of a dullish hue, which, from its not twinkling, you will ascertain to be a planet. This is called Saturn, from one of those abominable objects, which in former times was worshipped by the Greeks, and celebrated in their impious and absurd poems.

On the 20th, the Moon is upon the meridian at eight o'clock, the two stars of the Twins being now to the west of her. This day is remarkable, as being that on which the day and night are of the same length in every part of the Earth; the Sun rises due east, and sets due west; and from this day the religious year of the Jews ought to begin*. On the 21st, the Moon is on the meridian at fifty-one minutes past eight, when a line drawn from her through the Lion's heart, the large star about seventeen degrees east of her, will pass very near to Saturn; and, being continued, very near to a beautifully bright star near to the horizon, called the Ear of Corn, or the first star in the constellation called the Virgin.

---

* See the command for the beginning of the sacred year in the Pentateuch.

On the 22d, the Moon will be seen much nearer to the Lion's heart; as at thirty-eight minutes past nine she will pass the small star called the thirteenth of the Lion; and in the course of the evening will pass the Lion's heart, which is within three degrees of the thirteenth star. On the 23d, she passes the meridian at twenty-one minutes past ten, when the Lion's heart will be seen to the west of her, Saturn and the Ear of Corn to the east of her. On the 24th, she will be seen to have approached much nearer to Saturn, within a degree of whom is to be seen a very small star, the eleventh of the Virgin. On the 25th, the Moon passes Saturn, and will be seen at its rising about six degrees only from it. About eight is the most favourable time within our limits for observing the heavens, when most of the stars of our acquaintance will be in the western part of the heavens: the three stars in the Ram near to the horizon; higher up Venus; still higher the Pleiades; and much more so Capella: Aldebaran in the west-south-west; Orion in the south-west; Sirius in the south-south-west; higher up, and nearer to the meridian, the two stars in the Lesser Dog; and still higher up the two stars in the Twins. In the eastern part of the heavens we distinguish the Lion's heart, the Moon, Saturn, and the Ear of Corn just rising.

On the 26th, the Moon is seen to have receded from Saturn, and to be about midway between this planet and the Ear of Corn. About half past nine will be a favourable time for observing the Lion's heart, Saturn, the Moon, and the Ear of Corn, as the Lion's heart will then be upon the meridian, and the four objects are nearly in a line.

On the 27th, the Moon passes the Ear of Corn, and at ten o'clock gives us an opportunity of discovering another planet. A line, drawn from the zenith to the south-east, will very nearly pass through the Moon and the Ear of Corn: carry your eye to the east of this line, and about ten degrees from the Moon is a brilliant orb, worthy of a better name. It is called Jupiter, from that compound of detestable qualities, which the folly of the ancients supposed to be united to the Supreme Being. This Jupiter they made the first of their rabble of gods, and degraded themselves to so low and base a pitch, as to worship the statues made in his honour. The two planets, Jupiter and Saturn, with the Moon, and the two first stars in the Lion and the Virgin, form a splendid picture. Nearly midway between Jupiter and Saturn is another planet, lately discovered, which, from the name of the discoverer, is called Herschel, but it is scarcely to be seen by the naked eye.

On the 28th, the Moon will be seen to have receded from the first of the Virgin, and to be nearer to Jupiter, whom it passes in the course of the night. On the 29th, when the Moon rises, the eastern part of the heavens will be interesting to us; the bright star, about six degrees above it, is the first in the constellation called the Balance; higher up in the south-east is Jupiter; higher up, but more to the southward, is the first of the Virgin; and still higher up, but nearly in the south-south-east, is Saturn. The first of the Lion is in the western part, about twelve degrees from the meridian. As the position of the heavens in other respects will be nearly the same for the three next days, as in the earlier part of the following month, we may defer till then the description of them.

APRIL, 1804.

TO determine the position of objects, we have as yet had only sixteen points in the horizon: but this number is not sufficient, and by a very ingenious device it may be doubled. The word *by* is applied to eight points; and if you divide the *arc* between every two of the sixteen adjoining points already found, our compass will be complete. Thus, between the points north and north-north-east, find the middle point, by which write N by E to denote north-by-east, or the first point to the east of the north: in the same manner the middle point between north and north-north-west, is marked N by W, to denote north-by-west, or the first point to the west of the north. We shall, by performing the same operation on each of the eight points first made, have thirty-two points in the following order:—

N * N by E * NNE * NE by N * NE * * NE by E * ENE * E by N * E * * * E by S * ESE * SE by E * S E * * S E by S * S S E * S by E * S * * * S by W * S S W * S W by S * S W * * S W by W * W S W * W by S * W * * * W by N * W N W * N W by W * N W * * N W by N * N N W * N by W * N.

The circle is thus divided into thirty-two parts; and as there are three hundred and sixty degrees also in the circle, if we divide three hundred and sixty degrees by thirty-two, or ninety degrees by eight, we shall have the number of degrees between two adjacent points. Now ninety, divided by eight, gives eleven degrees and a quarter; that is, there are eleven degrees fifteen minutes between two adjacent points; and we may now see what is meant by a ship's sailing within so many points of the wind. If we look to the point whence the wind comes, and observe the point to which the line of the ship's path, or the line connecting the masts is directed, then the number of our points between these two points thus found may be ascertained. If the wind came from the north point, and the direction of the ship's path was to the north-west-by-north, then the ship is sailing at three points of the wind: if the path was directed to a point between west and south-by-west, then she is sailing within nine points of the wind. It may be amusing for a few persons to make each a circle, and marking only the north point, or any other point, determine to mark down, without any farther assistance, a point mentioned. Thus, let it be required to mark down the south-south-west point; then all the circles may be compared together, and the best eye is to determine which is best done. If it were required to set off five points and a half to the south of west-by-south, then the mark is to be made between south-by-west and south-south-west. The amusement may be varied, by requiring not only points and half points, but quarter points, to be marked off, and the unskilful person may have an innocent joke against him, when he attempts to find the point nine points to the east of east-by-north.

As we shall not derive any material assistance from the Moon till the 12th, we will take the position of the heavens for the evening of the 6th, which may serve for these twelve days, by adding about three minutes for each day before the 6th, and subtracting about three minutes for each day after the 6th. As soon then as the twilight will permit us on the 6th, we shall see Venus in the western part of the heavens; and we may amuse ourselves by naming the principal stars with which we are acquainted, as their brightness makes them discoverable. The western part is now rich, and at half past eight the following objects present themselves. Venus near the horizon about west-north-west; above her about three degrees off the Pleiades; a line continued from Venus through the Pleiades will pass nearly through Capella, which is in about mid-heaven, and in direction west-north-west of the observer. Aldebaran and the Hyades are nearly due west, and a line drawn from Venus through Aldebaran will pass through Orion, who is between the west-by-south and the west-south-west points. The line continued will pass over Sirius, who is to the south-west of the observer: and a line drawn from the zenith to Sirius, will pass nearly through the Lesser Dog star: and to the west of this line, above the Lesser Dog star, will be seen the two stars of the Twins.

In the eastern part of the heavens we shall observe near the meridian, and little more than half way between the horizon and the zenith, the Lion's heart, or first star of the Lion; and, turning our face from that star to nearly the south-east, we shall discover Saturn; and turning more to the east, in the south-east-by-east, and lower down, we shall perceive the brilliant star called the Ear of Corn, or the first of the Virgin. On turning still farther to the east, Jupiter just risen will strike our attention in the east-south-east. We cannot fail of recognizing these objects, if we draw a line with our hands from the first star of the Lion to the east-south-east point, as this line will nearly pass by Saturn, the first of the Virgin, and Jupiter. And now we may begin to travel far beyond the Moon's limits, and if we direct our eye from the zenith towards the north, about ten degrees to the east of the meridian, seven brilliant stars, well known by the countryman, will strike your attention. By him they are called Charles's Wain, or Waggon; by the astronomer, the Northern Bear. The two stars nearest the meridian are the first and second stars of the Bear, or the hind wheels of the Waggon: the two stars lower down, are the third and fourth of the Bear, or the fore wheels of the Waggon: the three stars farther down are the fifth, sixth, and seventh stars of the Northern Bear, or the three horses of the Waggon. Near to the sixth, or middle of these three stars, is a small star, which the countryman calls the Waggoner. About ten o'clock the two first stars of the Bear will be upon the meridian, the first being the lowest down.

On the 12th, our attention is called to the Moon, and, if the evening is fine, a particular appearance may afford us some pleasure. This is called by the astronomers an occultation of a star, or the hiding of a star by some object between us and the star. In this case one of the stars of the Pleiades is hid or covered from our sight by the Moon; and we have thus a convincing proof, that the star is at a greater distance from us than the Moon. At forty-nine minutes and a half past seven, the seventh star of the Pleiades will just touch the Moon's edge, and then disappear; and at twelve minutes and a quarter past eight, it will appear again emerging from an opposite rim. Others of the Pleiades will be occulted or hidden in the same manner; and thus we cannot fail of fixing in our memory, if any thing should have happened to prevent it before, the position of the six beautiful stars called the Pleiades. On the emersion of the seventh star, the appearance of the western heavens is very beautiful: about six degrees from the Moon is Venus, and a line drawn from the Moon through Venus will pass nearly through Aldebaran and the Hyades, directing us to Orion, and to the brilliancy of Sirius. In the eastern part of the heavens we shall perceive the first of the Lion near to the meridian, and thence discover Saturn, and the first of the Virgin. The two first stars of the Bear are now at no great distance from the meridian.

On the 13th, the Moon will be seen to the east of Venus, with whom and Aldebaran it forms a beautiful triangle; and a line, drawn from Aldebaran through the Moon, conducts us to the brilliancy of Capella. We shall not fail of noticing the second star in the Bull, or the bright star btween six and seven degrees to the east of the Moon. On the 14th, the Moon will be seen to the west of the second star of the Bull, and to be approaching the Twins. On the 15th, she will be seen at about nine degrees distance from the second of the Twins, four degrees east of the fifth of the Twins, and at nine o'clock we may note the position of the heavens, which will be nearly the same for several following nights.

The horizon from the north-west-by-west to the south-west-by-west is very rich. Nearly north-west-by-west we perceive the Pleiades and Venus near to the horizon; and, as we gradually turn our face more southerly, Aldebaran, the Hyades, Orion, and Sirius, pass us in succession. The second star in Orion is set, the lowest star in the Sword is just upon the horizon, and Sirius about five degrees from the horizon. The Twins are nearly in mid-heavens, and west-by-south of us: the two stars of the Lesser Dog much lower, and nearly in the quarter south-west-by-west. The first of the Lion is now in the western part of the heavens, and near to the meridian. The two first stars of the Bear are in the eastern part, and very near to the meridian; and a line, drawn from the second or highest through the first, will pass very nearly through the north point; and here is a good opportunity of distinguishing a small star, though the most remarkable of any in the heavens. The two first stars of the Bear are called the Pointers, because a line drawn from the second through the first points to a star, which is called the north polar star, and which was the great conductor of the ancients, when they ventured to sail far from the shores at night. This star does not seem to move like the other stars; it retains the same place constantly in the heavens; and if we draw a line with our hands in the direction of the pointers two or three times in the evening, at the interval of half an hour from each observation, we cannot fail of discovering the star. In the direction nearly south-south-east we shall discover Saturn, not so high as mid-heaven, and in the south-east the first of the Virgin; and turning a litttle more to the eastward we shall perceive, lower down, Jupiter. Thus we have three planets, Venus, Saturn, Jupiter, on which to fix our attention. On the 16th, the Moon will be seen considerably to the east of the Twins; and, I presume, that you will on this and a few more nights draw a line through the pointers of the North Bear at several intervals, till you have discovered the north polar star, or star which has no apparent motion in the heavens. On the 17th, the Moon will be seen about two degrees distant from the fourth star of the Crab to the east of it, as she passed this star at half past four this afternoon; and this star, the Moon, and the Lion's heart, will be nearly in a straight line. On the 18th, the Moon will be seen to have approached much nearer to the Lion's heart, being within six degrees of it at nine o'clock, and she will pass it before the next evening.

On the 20th, the Moon is on the meridian at ten minutes past nine, and at this time her diameter is very nearly half a degree in length, as at midnight it is exactly half a degree. A line now may be very nearly drawn from the Moon through the pointers to the north polar star, and it will pass through a star about eighteen degrees above the Moon, which is the fourth star of the Lion. Turning from viewing the Moon in this situation to nearly south-by-east, we discover Saturn, and farther to the eastward, in south-east-by-south, the first of the Virgin, and in the south-east Jupiter, at eleven degrees distance from whom, and midway between south-east and south-east-by-east, is the first star of the Balance, a bright star, though much inferior to the first star of the Virgin. As, by drawing your hand in the direction of the line drawn through the pointers, you are now expert in marking positions, you may amuse yourself by a similar experiment, and drawing a line through the sixth and seventh stars of the Bear towards the horizon, you will, by looking to the west of this line, at the distance of between twenty and thirty degrees from the seventh star, be struck with the brilliancy of a star of the first magnitude. This is the first star in the constellation called Bootes, and the star itself, from its peculiar brilliancy, is deserving of a name, and is called Arcturus. You will observe, that a line, drawn from Arcturus through the seventh star of the Bear, passes very nearly through the north polar star. In the western part of the heavens you will see to the north-west-by-west the Pleiades very near to the horizon; and higher in the heavens, Capella: Venus cannot fail of striking you, though she is now far removed from the Pleiades, being nearly at an equal distance from Aldebaran and the second star of the Bull. The stars in the belt of Orion are now setting about five degrees to the south of west; the third star of Orion is seen a little above the horizon to the north of west; and the first star somewhat higher. Sirius is disappearing. The stars of the Twins are in mid-heavens to the west, and much lower down to the west-south-west are the two stars of the Lesser Dog. The Lion's heart is in the direction nearly south-south-west.

On the 21st, the Moon passes the meridian at fifty-one minutes past nine, its diameter being diminished about fifteen seconds; and it will continue to diminish in diameter every night till the 25th, when the diameter will be only twenty-nine minutes and a third of a minute. She passes Saturn on the night of the 21st, being then about six degrees below her. On the 22d, she will be seen considerably to the east of Saturn, and approaching to the first of the Virgin, being nearly midway between this star and Saturn, and forming with them a triangle. On the 23d, she will be seen to have approached very nearly to the first of the Virgin, being little more than two degrees below it, and as she is approaching to Jupiter, the two planets, with the star and the Moon, form a group worthy of notice. On the 24th, she will be seen near to Jupiter, having approached to about six degrees from him; and a line now drawn from the Moon through Jupiter will pass very nearly through Arcturus. A beautiful group is thus made by Jupiter, Arcturus, Saturn, the first of the Virgin, and the Moon.

On the 25th, she will be seen to have receded considerably from Jupiter, and to have passed a bright star, the first of the Balance, which is about five degrees from her. At nine o'clock, the position of the heavens is as follows: in the west Venus under the star, which is the second in the Bull: in the north-west-by-west, nearly in mid-heaven, Capella; and in the west-by-south, about the same height, the two stars of the Twins; the two stars of the Lesser Dog being underneath them in the west-south-west. Nearly in the south-south-west, in mid-heaven, is the first of the Lion.

Near the meridian on the western side are the two first stars of the Bear, and the fourth of the Lion: on the eastern side, the third and fourth stars of the Bear, the second of the Lion, and Saturn. The group formed by the first, the third, the fourth, the second of the Lion, and Saturn, will naturally fix your attention, and you will distinguish them in the order specified. The bright star eight degrees above the first of the Lion is the third of the Lion; and higher up in the western hemisphere, but near to the meridian, is the fourth of the Lion: lower down, but near to the meridian in the eastern hemisphere, is the second of the Lion; and lower down, and rather farther from the meridian, is Saturn.

Since the meridian passes thus between the two first, and the third and fourth stars of the Great Bear, we look naturally for the three next in the eastern hemisphere; and the sixth and seventh stars point out to you Arcturus in mid-heaven. Jupiter is seen in the south-east; and higher up, and to the south of him, the first of the Virgin.

On the 26th, the Moon will be seen approaching two bright stars, which are the first and second of the Scorpion, being about six degrees from the nearest, or the second star; and on the 27th she will be only a degree from the first. The first star is called Antares, and the two stars of the Scorpion, being nearly in a right line with the Moon, cannot fail, in a clear sky, of being distinguished. On the 28th, she will have receded considerably from Antares; but will still, if the preceding evenings did not point out this star, be of service in discovering it, as it is the most brilliant star in its neighbourhood to the west. As the position of the heavens for the remainder of the month is nearly the same as in the beginning of next month, we will refer to that description for our guide, and be careful to fix Antares and the second star of the Scorpion in our memory. For the last four days of this month an opportunity may be offered of seeing the planet Mercury; but it requires a good look out, as the planet sets almost as soon as the twilight gives it a chance of being visible. The last evening of the month is the most favourable for the purpose, and you must keep your eye near the point of the setting Sun.

MAY, 1804.

IF the weather was sufficiently favourable last month to show you the gradual approach of the Moon to the seventh star of the Pleiades, you may probably have formed a conjecture, that the appulse of the rim to the star might be made very useful to the inhabitants of the Earth. It is certainly useful, but not in the degree you apprehend: for the moment of appulse will not be the same to all who are looking at the Moon, and for persons in some situations there will be no appulse at all. You will easily understand this, by conceiving a distant object on a plain, a house for example, which is hid from your view by a wall twenty feet in length: now to many persons, a quarter of a mile from you at this moment, the wall will be no obstacle, and they will have a full view of the house. You may make this very clear to yourself by taking a point on a piece of paper, and drawing a line at some distance from it, to represent the top of the wall. Then draw two lines from the point to the two ends of the wall, and produce these lines. All objects, that are within these two lines produced, and the back of the wall, and lower than the wall, will not be visible to a person standing at the point. Draw within these limits a line to represent the part of the house below the wall, and draw from the ends of this line two lines to the ends of the wall; then all persons standing within these lines produced, and the fore part of the wall, will not be able to see any part of the house, unless it is higher than the wall; but all persons, without these limits, will, at a suitable distance, and no other obstacle intervening, see either the whole house, or part of the house. In the same manner the Moon, though at a great distance from us, is so near, in comparison of the fixed star, that, though she hides the star from persons in certain situations, yet she cannot prevent it from being seen by people in other places. If, however, the occultation is not so useful as you at first conjectured, it may be, and probably will be, made much more useful than it has hitherto been, and at no great trouble or expense. Watches might be sent from Greenwich to persons living near the chief headlands and towns of our island, who would have nothing else to do but to note the appulse of the Moon to the star, and the moment of the star's emersion by the watch, and return the watch with the account of these times to the Astronomer Royal at Greenwich. He would perceive easily whether the observation was correct; and, if the going of the watch was not altered, would determine precisely the longitude of the place. The solution of this problem may hereafter amuse you; at present we will pursue our researches into the state of the heavenly bodies.

By means of the pointers in the Bear you have by this time, I presume, discovered the north polar star, or that star in the heavens which seems to be in the same place every night: and, as you have perceived, that some stars rise and set, and have now found that there is one always in the same place, you will naturally guess that there are others, which, without rising or setting, are to be seen every night, in a cloudless sky, in some part of the heavens. The stars in the Bear are of this kind; and, by looking at them throughout the year, you will perceive them sometimes on the meridian between the north star and the zenith, and sometimes on the meridian between the north star and the horizon: and all those stars, which are thus seen in the meridian between the north star and the horizon never set. Thus, then, the stars, which appear above our horizon, are of three kinds: those which rise and set; those which are always visible in the night in a cloudless sky, and make a circle round the north star; and one which never appears to move. We say, it never appears to move, because to the naked eye it appears to be stationary: but accurate instruments discover to us, that its position is changeable, and that it describes a very small circle round a point, which is called the North Pole.

We may now amuse ourselves with our pen and paper in another manner. Make a semicircle, or half circle, and let it represent the meridian, and join the two ends by a right line, and place the figure so that the straight line may be before you, and the curve beyond it. Then, since the meridian cuts the horizon in the north and south points, the end on the right hand side will be the north point, and the end on the left hand the south point: write N at the right end, and S at the left end. Exactly in the middle of the curve, between N and S, make a point, and write Z by it, to denote the zenith, or the point directly over your head. Find another point between Z and N, just at the same distance from those points as the north polar star seems to you to be from the zenith and the horizon, and write P for it, to denote the polar star. In the middle of the line, between N and S, take a point and write E for it, to denote the east point: then the points between the east and south may be marked on the line E S, and the points between the east and north on the line E N. Thus, you will have a flat surface prepared, to mark the situation of objects in some degree as they appear on the hollow surface of the heavens; and when the Moon is on the meridian, by marking a point at the height, at which it appears to be above the horizon, you may from it mark the situation of other objects. The surface we have thus drawn will represent only the eastern part of the heavens: but by drawing, in the same manner, another semicircle, and placing W for west in the middle of the line, between the two ends, we shall have a surface to represent the western part of the heavens. The meridian we have observed to be a semicircle;

but as the heavens under our horizon are of the same extent as what we see above it, there will be a similar meridian underneath us; and the two meridians will thus form a complete circle, dividing the heavens into two equal parts. Now the heavens, thus considered, are of the form of a globe, or ball, or sphere, the latter being the name, derived from the Greek, used to signify a globe; and a hemisphere means a half of the globe. Hence the meridian will divide the globe or sphere into two half spheres, or hemispheres; and we shall hereafter use the latter term, denoting the eastern part of the heavens by the term the eastern hemisphere, and the western part of the heavens by the term the western hemisphere. In the same manner, the horizon divides the heavens into two parts, the part visible, and the part invisible to us; which are thence called the visible, and the invisible hemispheres: and as the north polar star is in our visible hemisphere, it is called the northern hemisphere; and the invisible hemisphere is called the southern hemisphere.

In the early part of this month we derive no assistance from the Moon; but Venus will, and perhaps Mercury may, gratify us with their splendour. Both these planets are at Sun-set in the western hemisphere, Mercury much nearer to the horizon than Venus, and to the north of her. The seventh evening will be very favourable for viewing Mercury; and a little before nine is the best opportunity, as the twilight will then be much diminished, and he is not too near the horizon; soon after nine he sets; the splendour of Venus will be always our direction to him, and no other two stars can vie with them in splendour. On the 1st day Venus is seen about five degrees from the second star in the Bull, and a line drawn through this star, and produced through Venus, will pass nearly through the third star of the Twins, and the second and first stars of the Lesser Dog. Every succeeding night she will appear to have moved about a degree, and on the 7th to be about midway between the second star of the Bull and the third of the Twins, with whom she makes a triangle, being herself nearest to the zenith. At nine o'clock the appearance in the western hemisphere is brilliant. Capella to the north-west; Mercury in the horizon, north-west-by-west; above him the second star of the Bull; Venus nearly west-by-north; and near to the horizon, west of her, the first star of Orion. In west-by-south the two stars of the Lesser Dog, and nearly south-west, in mid-heaven, the first star of the Lion. Saturn is now in the meridian, the two pointers are near the meridian, and the third and fourth stars of the Bear almost on the meridian. The fifth, sixth, and seventh stars of the Bear are in the eastern hemisphere; in which are also the stars of the Lesser Bear, a constellation very much resembling the Greater Bear; the polar star being at the end of the tail, and to the eastward of it two smaller stars, forming with it the tail. More to the east are four stars, similar in position to the four first stars of the Greater Bear. A line, drawn from the third and fourth stars of the Great Bear, will pass through the third star of the Lesser Bear, or that in his fore shoulder. The sixth and seventh stars of the Bear direct us as usual to the splendour of Arcturus; and, if we turn our eyes from him to the direction east-by-south, we shall perceive, nearly in mid-heaven, a cluster of stars, of which one is much brighter than the rest, though far less bright than Arcturus; the cluster, from its similarity in shape to a crown, is called the Northern Crown. The brightest of the stars composing the Crown is called the first of the Crown. Near to the south-south-east we recognize the first of the Virgin; and near to it, but to the eastward, Jupiter; and to the east of Jupiter, but near to the horizon, the first of the Balance. During this month Saturn and Jupiter seem scarcely to change their places; Saturn moving little more than a degree and a half, and Jupiter little more than two degrees and a half in the whole month. When Saturn is in the meridian, he will afford us a good opportunity of distinguishing a bright star, very near to the meridian, in the western hemisphere, but higher up; and Saturn forms with this star and the Lion's heart, during the month, a triangle, of which the greater side is the distance between the first of the Lion and Saturn, and the least side is the distance between Saturn and the second of the Lion.

Venus now appears to travel towards the two stars in the Twins, at about the rate of a degree a day; on the 11th, the Moon will be seen to the west of her; on the 12th to the east. They are very near to each other at forty-four minutes past eight in the evening of the 12th, and at forty-nine minutes past nine

Venus passes very near to the fifth star in the Twins, the small star, which at this time is fifty-one minutes and a half to the south of her. On the 13th, the Moon is seen to have receded from Venus, and to have approached near to the second star of the Twins. On the 14th, she will have receded to a great distance from the Twins, and pass the fourth star of the Crab, to which she will be very near between nine and ten in the evening, as she passes within a degree of it at forty-three minutes past eleven. On the 15th, we may take notice of the following appearances in the heavens between nine and ten in the evening.

Mercury is near the horizon; but, if the evenings are fine, he will be clearly visible about nine o'clock, and this is a most favourable opportunity for seeing him. Above Mercury is the second star of the Bull. Capella is to the north of north-west; Venus in the west-north-west, at nearly equal distances between the first and third stars of the Twins. The first star of the Lesser Dog is in the west, near the horizon, the Moon directing us to the first of the Lion, which is to the south of west-south-west; Saturn in the south-south-west. The four first stars of the Bear are in the western hemisphere, in which are also all the objects we have mentioned. And now, if we draw a line from the fourth through the third star of the Bear till it meets the horizon, it will nearly pass through the first of the Lion, above which nine degrees in this line is a star of inferior splendour, which is the third of the Lion ; and the star near the horizon in this line, of the same brightness nearly with the third of the Lion, is the first star in the Hydra. We have now the principal stars in the Lion marked out: the first having been often noted for its superior splendour; the second, or star in the Lion's tail, being much nearer to Saturn; the third being in the line above mentioned. In the meridian is the fifth star of the Bear; the first of the Virgin near to the meridian, in the eastern hemisphere, in which are Jupiter, Arcturus, the Northern Crown, the first of the Balance, and Antares, or the first of the Scorpion. Jupiter is at some distance farther from the meridian than the first of the Virgin; Arcturus and the first of the Balance in the south-south-east; Antares in the horizon in the south-east; the first of the Northern Crown in the south-east-by-east.

On the 16th, the Moon will be seen within three degrees of the first of the Lion, having passed that star in the course of the day. On the 17th, she will be seen between the first of the Lion and Saturn, but nearest to Saturn; and the group, formed by the Moon, Saturn, the second, the third, and the first of the Lion, is worthy of observation. On the 18th, she will be seen to have approached much nearer to Saturn, though she is still to the west of him; and we may now observe a star between the Moon and Saturn, which is the second of the Virgin, the star being within three degrees of Saturn. On the 19th, the Moon will be seen to the east of Saturn, and to be travelling towards the first of the Virgin and Jupiter, being almost midway between the first of the Virgin and Saturn. At half past eight she will be nearly upon the meridian. On the 20th, the Moon is on the meridian at a quarter past nine, being about three degrees from the first of the Virgin, which is in the eastern hemisphere, and of course very near to the meridian. On the 21st, she will be seen to the east of the first of the Virgin, and to be near to Jupiter, having approached in the course of the day to between six and seven degrees of him. She is this evening on the meridian at fifty-seven minutes past nine, at which time Jupiter will be seen above her, almost upon the meridian, and the Ear of Corn in the western hemisphere, near to the meridian. These three objects now form a beautiful triangle; and if we look higher up on the meridian, the splendour of Arcturus will add to the beauty of the picture. On the 22d, the Moon is on the meridian at forty-one minutes past ten; the bright star about five degrees above it being the first of the Balance. In the south-south-east, near to the horizon, you will admire the brilliancy of Antares. On the 23d, the Moon will be seen to have receded considerably from the first of the Balance, and to be approaching to two bright stars, Antares and the second of the Scorpion. From the situation of objects in the heavens about a quarter before ten this evening, we may form a picture of them for several evenings preceding and succeeding. The three planets, Venus, Saturn, Jupiter, are in the western hemisphere: Jupiter very near to the meridian; Saturn towards the south-west; Venus towards west-north-west. Carrying your eye from Venus northwards, you perceive the two stars of the Twins;

and farther still to the north, towards the north-west-by-north, you perceive Capella, about the same height as the Twins above the horizon. The seven stars in the North Bear are in the western hemisphere, the seventh star being very nearly on the meridian. Towards west-by-south is the first star of the Lion, from which you will recognize the bright star, the third of the Lion, about nine degrees above it, and the second above the line joining the first of the Lion and Saturn. Nearer to the meridian you will perceive the first star of the Virgin. Arcturus is perceived near to the meridian; and on the opposite side of the zenith, not quite so near the meridian, are the second and third stars of the Lesser Bear. The constellation may now be well marked out by looking to the east-by-north. A bright star is now on the meridian, about midway between the second and third stars of the Lesser Bear, and the sixth of the Great Bear. This star is called the first of the Dragon, and a line, drawn from the sixth of the Great Bear through this star, will pass between the second and third stars of the Lesser Bear. In the south-east-by-south, higher up than Arcturus, you will recognize the Northern Crown; and, in the same direction, but very near to the horizon, you will perceive Antares, and above it the second star of the Scorpion. Looking to the east-south-east, about midway between the Northern Crown and the horizon, you will perceive two stars of nearly equal brightness, but very inferior splendour to Arcturus, though excelling that of the stars in their neighbourhood: the lowest is the first of the Serpent-bearer, the other the first of Hercules. On these evenings you may form a very good idea of the Earth's path, as a line passing between Jupiter and the first of the Virgin, to the south of Saturn, through the first of the Lion, to the south of Venus and Mercury, is very nearly that described by the Earth during five months of the year.

On the 24th, the Moon will be seen very near to Antares, as she passes the small star about two degrees to the west of him at forty-eight minutes past five in the afternoon; and, at forty-four minutes past nine she passes within a degree of Antares. Of course, at ten o'clock you will have an excellent opportunity of distinguishing this beautiful star, as well as its companion, higher up, or the second star in the Scorpion. On the 25th, the Moon will be seen to have advanced considerably to the eastward of Antares. On the 26th, we may notice the beautiful position of Venus, under the two stars of the Twins; the second star being nearly at an equal distance from the first and from Venus, who passes on this day, within seventeen minutes and a half, a small star, which is the tenth in the Twins. On the 27th, Mercury is stationary. On the 29th, Saturn is stationary. Upon the whole, this is a very interesting month. Our evening walks may be enlivened by observing the splendour of Venus and Mercury, as they disengage themselves from the rays of the setting Sun; and we shall have the opportunity of contrasting the various hues of the four planets, Mercury, Venus, Saturn, Jupiter. In the early part of the month Saturn and Jupiter will be seen at ten o'clock at night, the first in the western, the other in the eastern hemispheres; in the latter part of the month they will both be seen at this hour in the western hemisphere. I would recommend to you this month to pay some attention to a very interesting phenomenon, the nature of the twilight. You will perceive every evening, that the Sun sets nearer to the north point than it did in the preceding evening;

that in consequence the northern part of the horizon is much more luminous than the southern; and, if you happen to be travelling in the night, you may amuse yourself by determining the Sun's place from the power of its rays on the various points of the northern horizon.

JUNE, 1804.

THE month of June is not favourable to observations on the stars, within the limits which we have prescribed to ourselves; but the setting Sun in a glowing sky enriches in compensation our evening walk. We may now amuse ourselves with tracing the path of the Sun under the horizon, whose northern limits are never forsaken by its beams. This month is remarkable from the Earth being, on the 21st, at its greatest distance from the Sun; and on this day the Sun is at noon higher on the meridian than on any other day of the year. Hence it appears to describe a greater arch of a circle between rising and setting than on any other day; and this is the longest day to us, and every inhabitant of the Earth living between the equator and the arctic circle. On this day the Sun appears at rising between the north-east-by-east and the north-east points, and at setting between the north-west-by-west and north-west points. To those who live north of London, the Sun appears nearer to the north at rising; and to those who live south of London, nearer to the east; and at setting the Sun appears to those, who live north of London, nearer to the north; but to those who live south of London, nearer to the west. As during this whole month the Sun is never eighteen degrees below the horizon, the whole tract from the north-west to the north, and thence to the north-east, will be enlivened by its rays: at midnight the light will be the least, but from that time the eastern horizon grows gradually lighter, till the Sun arises in splendid majesty to run his destined course. As it is usual to say, that at this time of the year there is no night, we cannot expect to see so many stars as usual; those near the northern horizon will be less visible than the others near the southern horizon, and in the former situation they must be very brilliant stars to be at all visible. The eastern hemisphere will afford most objects now worthy of observation, except the planets in the western hemisphere, whose brilliancy will overcome the twilight; and the part between the south and the east may, in a returning evening walk, frequently call our attention.

As soon as the Sun has sunk sufficiently below the horizon, the evening star shines forth in the west, and during the whole month her appearance succeeds nearly at the same time that of the setting Sun. At first she appears, and for some time, without any companion: but as she sinks towards the horizon, the two stars of the Twins, in whose neighbourhood she is, become visible, and every succeeding evening she may be observed to have receded from them, and at the end of the month to have approached towards the first star of the Lion. Saturn retains very nearly the same situation with respect to the second star of the Virgin, not moving in the course of the month much more than half a degree; and Jupiter has in this time very little more apparent motion, as it does not amount to a degree. The three planets, Venus, Saturn, and Jupiter, all appear at the same time in the western hemisphere. Venus is the most splendid, and is the first disengaged from the beams of the Sun; the strong light of Jupiter next prevails: the dulness of Saturn scarcely gives him the precedency over the fixed stars. An evening party may be amused in discovering these planets at their first appearance; in comparing together their aspects and different degrees of splendour, in contrasting their brilliancy with that of the fixed stars. You will naturally remark, also, how few stars appear now to be in the heavens, compared with those that are seen in a frosty evening's sky; the stars, which are said to be of an inferior magnitude, have not a light sufficiently strong to overcome that which the reflected rays of the Sun impart to the heavens: but you are not hence to conclude, that we can thus form any opinion of the magnitude of the stars.

The brightness of an object depends on several things: first, whether it is luminous in itself, or derives its light from another body. The fixed stars are luminous in themselves; the planets derive their light from the Sun, whose beams are reflected by the surface of the planet to our eye. The planets differ in magnitude from each other; of the three just mentioned, Jupiter is the largest, Venus the least; yet Venus is the brightest. Hence you see the necessity of inquiring into some other cause of brightness than magnitude, and this will be found in the different degrees of distance. Venus is the nearest to, and Saturn the most remote from the Earth. Hence Venus, though far inferior in size to Jupiter, is, from its nearness to us, superior in splendour: and Saturn, being both smaller and more remote than Jupiter, cannot have so brilliant an aspect. The different degrees of brightness in Venus at different times are very remarkable; and frequently she shines with so strong a light, as to be seen in the morning after Sun-rise, and in the evening before Sun-set. This is owing to its different distances, and the quantity of light which it reflects to us from the Sun: for Venus, when seen through a telescope, appears like the Moon: and, when she is nearest to us, has her dark face towards us. When she is farthest from us she shines with a full face; but then from the distance her brightness is not so great as when, though the shining part is less, the distance is considerably diminished.

With respect to the fixed stars, we have no means of forming a judgment of their size; the nearest of them is too remote to give us an opportunity of calculating its distance. Hence the distinction, which is made between the fixed stars according to magnitude, when they are said to be of the first, second, third, &c.

magnitudes, refers only to their different degrees of brightness; stars of the first magnitude being the brightest; of the second, next to them in splendour, and so on. Sirius is, you have perceived, the brightest of all the stars; and its distance is, we know, so great from us, that it exceeds any means of measuring it hitherto discovered. All the other fixed stars are at a distance from us, which we cannot measure; the brightest, therefore, may be the least bodies, and those of inferior splendour may be of great magnitude. We distinguish them for convenience only into stars of first, second, and third magnitudes; and from Sirius, Aldebaran, Capella, the first of the Virgin, and Antares, you may form an adequate notion of what is called a star of the first magnitude.

I shall for this month point out the aspect of the heavens only at one hour in the evening, at ten o'clock, as from your now sufficient experience, it is presumed, that you can judge from that aspect, what is to be seen for some time before and after the time pointed out, as also determine the position of the heavens at that time for some days preceding and succeeding. We will begin with the aspect of the heavens on the third of June. Venus is now in the west-north-west, near the horizon: to the north of her the two stars of the Twins: to the north-north-west Capella, if visible, is near the horizon. High up in the west-north-west are the seven stars of the Bear, the seventh being near the meridian; the sixth and seventh pointing to Arcturus, which is also near the meridian. To the south of west you will recognise the first of the Lion; and in the south-west-by-west, Saturn: in the south-south-west the first of the Virgin, and near to it, but more southwards, Jupiter. A line now drawn from Venus to Jupiter easily points out the first of the Lion, Saturn, and the first of the Virgin. The second star of the Lion above Saturn will be probably visible, as also the third of the Lion above the first; but this depends much on the state of the air.

The first of the Balance is on the meridian, but near to the horizon; and from this star, turning almost to the south-south-east, we shall discover by its brilliancy Antares, who is still nearer to the horizon. Higher up, but more southwards, is the second star of the Scorpion, which we cannot fail of recognising, from its being the only bright star near to Antares. About as far distant from the meridian on the eastern side, as Arcturus is on the western side of the meridian, but higher up, we recognise the Northern Crown; and lower down in the south-east, two bright stars near each other; the highest, the first of Hercules; the other, the first of the Serpent-bearer. And now, carrying your eye downward, you will perceive, rather to the south of east, a star of the first magnitude, which is the first of the Eagle: and, carrying your eye a little farther to the north of east, you will be struck with the position of four small stars, very near to each other, forming the corners of a four-sided figure, whose sides are almost equal. The stars are of the same brilliancy, but only of the third magnitude. A line, drawn with your hand from the zenith to the eastern point, will go between the first of the Eagle and these four stars, which are the four first stars of the Dolphin. If you look along the line thus drawn with your hand, you will be struck nearly half way down by another star of the first magnitude, which is the first star of the Harp. You have thus a beautiful group in the eastern hemisphere, formed by the Crown, the first star of Hercules, the Serpent-bearer, and the Eagle, the four little brilliants of the Dolphin, and the first star of the Harp. The second and third stars of the Lesser Bear are now near the meridian.

On the 9th, the Moon will begin to resume her nightly importance, being to the west of Venus, whom she approaches on the 10th, and passes on the 11th, being then midway between Venus and the first of the Lion. On the 12th, she is seen very near to, but to the west of this star, and on the 13th she is seen considerably to the eastward of it, being between this star and Saturn, but nearest to the star. On the 14th, she is seen very near to Saturn, when Venus, the first of the Lion, the Moon, Saturn, the second, fourth, and third of the Lion form a beautiful group. On the 15th, the Moon has passed Saturn, but has not reached the point midway between Saturn and the first of the Virgin. On this evening we may, at ten o'clock, take the following view of the heavens.

In the north-by-west, Capella is near the horizon; in the west-north-west, Venus; higher up in the west, the first of the Lion; still higher up in the west-by-south, the second of the Lion; lower down, and more to the south, Saturn; and in the south-west-by-south the first of the Virgin and Jupiter, having above them Arcturus.

The group formed by Saturn, the Moon, the first of the Virgin, Jupiter, and Arcturus, will be worthy of notice. Nearly in mid-heaven, towards the north-west, we recognise the seven stars of the Great Bear.

The second and third stars of the Lesser Bear, and the first of the Crown, are now nearly upon the meridian.

In the western hemisphere we perceive Antares near to the horizon, in south-by-east; and higher up, but very near to the meridian, the second star of the Scorpion. In south-east-by-south, about mid-heaven, are the two first stars of Hercules and the Serpent-bearer. In the east-south-east the splendour of the first star of the Eagle will strike us, and farther to the east the four little glittering stars of the Dolphin; and higher up we shall recognise the first of the Harp, which, with the two first of Hercules and the Serpent-bearer, the first of the Eagle, and the four of the Dolphin, forms a group worthy of notice, there being in it two stars of the first, two of the second, and four of the third magnitudes.

On the 16th, the Moon is seen to have approached near to the first of the Virgin, who is now nearly midway between the Moon and Jupiter; but on the 17th she is seen to the eastward of both star and planet: Saturn, the first of the Virgin, the Moon, Jupiter, and Arcturus, now forming a beautiful group. On the 18th, she has receded far from Jupiter, and approached the first of the Balance, which she passes on the next day, when she is seen midway between the first of the Balance and the second of the Scorpion. On the 20th, she is seen between the second of the Scorpion and Antares, whom she passes on the 21st; and you may have remarked on the preceding night, or you may on this night, how low she is when on the meridian, and of course how small a time she spends, when she is capable of giving us the most light, above our horizon. This is of little consequence this month, when we are favoured with so long a twilight; but you may remark, that her nightly track would now very much resemble the daily track of the Sun in the winter months, if she were not so low upon the meridian. On the 22d, she is so near the full, that her splendour will eclipse the small stars in her neighbourhood; but her course above the horizon will be short, the lunar days, if we may so call them, being the shortest when we have the least need of them. On the 26th, the aspect of the heavens will be, at ten o'clock, as follows, whence we may determine it for the days preceding, from the 20th, and also succeeding, to the beginning of next month.

Capella is seen very near to the meridian, to the north, in the western hemisphere, thus convincing us, from its present height above the horizon, that it is one of those stars which never set. In the same hemisphere, but to the north-west-by-west, are the seven stars of the Great Bear. Venus is now in the west-north-west, almost close to the horizon; and in west-by-north, some degrees higher, is the first of the

Lion. Saturn distinguishes himself in the west-by south, though not very high above the horizon; and turning rather more southerly than south-west-by-west, a line drawn by the hand from the zenith to this point, will direct us to Arcturus, the first of the Virgin, and Jupiter. In the south-west-by-south, but near to the zenith, we shall recognise the stars of the Crown; and at about the same distance from the horizon as Jupiter, the first of the Balance.

On the meridian, about thirteen degrees above the horizon, is Antares, and consequently its companion is above it in the western hemisphere, the second star of the Scorpion.

In the eastern hemisphere we discover, near the meridian, and in mid-heaven, the two first stars of Hercules and the Serpent-bearer; and carrying a line down from the zenith to the south-east-by-east, we are directed to the splendour of the first stars of the Harp and the Eagle. The four stars of the Dolphin will of course attract our attention a little more to the eastward. If you now draw a line from the first of the Harp to the Dolphin, you will perceive, about midway, but rather nearer to the first of the Harp, a star of the third magnitude, which may, however, be distinguished, as it has no other stars near it of equal magnitude. This is the second star of the Swan, and we may next month be led by it to discover the whole of that constellation.

JULY, 1804.

THE Sun during this month is every day at a less height on the meridian, than he was on the preceding day: his stay above the horizon is daily shortened; and he daily rises nearer to the east in the morning, and sets nearer to the west in the evening, than he did the day before. You may make this familiar to yourself by the meridian semicircle, which you drew on the horizontal line. Make, as directed in page 57, a meridian line, with the points Z and P in it, and in the horizontal line place the points S E and N. Then, as near as you can judge to be the noontide height of the Sun on the meridian for the 1st of July, make a mark, writing S near it, to represent the place of the Sun on the meridian, and on the horizontal line between E and N find the place about half point to the east of north-east, or point on which the Sun rose on the 1st of July. Join the point S to this point found in the horizon by a straight line, which may represent the *arc,* described by the Sun in the morning, from its rise to noon. Now, on the last of July the Sun is at noon much lower on the meridian, and it rises in a place about a quarter of a point east from north-east-by-east; draw a line from the point where it is on this day on the meridian, to its place in the horizon, which will represent the *arc* described on this day also between Sunrise and noon. The eye will thus perceive how the *arc* described by the Sun in the morning is diminished: and you may hence perceive, by drawing similar lines for the stars, from the points where they are on the meridian to their points in rising on the horizon, that they all describe *arcs* of very unequal lengths. In fact, the Sun and stars appear to describe circles round the pole; the circles nearest the pole are the smallest; they increase in size, till they come to that, which is described by the Sun on the day that it passes through a point in the meridian, just as high above the horizon as the pole is from the zenith. The circles then again diminish. If the circle described by the star is above our horizon, then it will be always visible in a cloudless night in the sky: if part only of the circle is above our horizon, then the number of hours that the Sun will be visible will be greater or less, according as the *arc* of the circle described by the Sun above our horizon, is greater or less than the *arc*, which is described under the horizon. During this month, the *arc* described by him above our horizon is greater than that described under our horizon, and of course the days are longer than the nights.

If we travel northwards, the polar star appears every night higher than it was the night before; and, if the icy sea did not prevent us, we might come to a place where the polar star would be always in the zenith, or directly over our heads. What would then be the appearance of the heavenly motions? A figure will easily explain it. In this case Z and P, from your former figure of the meridian line, would be brought together, and as the fixed stars are at a fixed distance from P, and describe a circle around it, it is evident, that at whatever height a star was upon the meridian at twelve o'clock at noon, it would be at the same height between the pole and the northern point at midnight. In the same manner the Sun would be nearly at the same height above the horizon on the meridian at opposite points, at noon and at midnight. It would not be exactly at the same height; because, in the course of the twelve hours, the motion of the Earth has made a small apparent motion of the Sun. Hence the Sun, if it appears at all to the inhabitants of this spot, remains visible during twenty-four hours; and the year is divided into two nearly equal seasons, one of perpetual day, the other of perpetual night.

Since the Sun's noontide height, and its stay above the horizon, are daily decreasing during this month, it may naturally excite your wonder, that the heat does not diminish in the same manner, and that this month should be in general much hotter than the preceding one. A slight degree of attention to what passes every day will obviate your surprise. At noon the height of the Sun is always the greatest: his rays, considered in themselves, are the most powerful; but the heat is not so great as when, in two hours more, his height and their power is much diminished. The fact is, he has been communicating heat to the Earth from his rise till noon: in the hour from one to two he communicates less heat than in the hour from twelve to one; but in the first hour of the afternoon there is an addition made to the heat, that there was at twelve; and in the second, an addition, though a less addition than the former, to the heat there was at one. A much less addition is made in the third hour, after which the usual temperature of the Earth and air begin to prevail, and the heat gradually diminishes. Thus the heat of the Sun in the winter months was not sufficient to overcome the cold produced in the nights: as his power increased, he had a greater power of cold to contend with, and his victory was scarcely completed, when his power to communicate heat began to diminish: but the subdued enemy had no means of recruiting his strength, till the Sun at the appointed time is obliged to submit to the superior dominion of the night.

If heat and cold, however, depended solely on the rays of the Sun, our seasons would be uniformly the same. Various causes contribute to make in this country, not only the seasons to have no resemblance one year to what they had the last, but to give us frequently in one day all the seasons of the year. Hence our poets are peculiarly unfortunate. They paint the beauties of the spring as they are described by the Sicilian bard, whilst we are shivering over a coal fire, or enclosing ourselves in a double security of flannel and leather, to guard us from the eastern blast. Little does it enter into their imagination, that their odes on the 1st of May may have to encounter a terrible storm of sleet and snow from the plains of Siberia; and that their shepherds and shepherdesses (a delightful set at all times in England) will, instead of soft tales to each other under hawthorn bushes, be glad to hurdle their sheep, and hurry to the chimney corner: thrice happy, if a mug of warm beer will assist with the blazing hearth, to restore a due degree of heat to their shivering limbs.

We do not often experience a very great transition from heat to cold in July. Our evening walks are in this month refreshed by a cooling breeze, and the glories of the setting Sun, with the brilliancy of three planets, are an agreeable exchange for the heat of a summer's day. We are this month to take our leave of one of them. Venus is daily slackening her pace, and the Earth increasing his, so that at the end of the month the beauteous star of even will descend unheeded in the rays of the setting Sun. Jupiter and Saturn have a small degree of apparent motion, Jupiter moving rather less, and Saturn rather more than a degree and a half during the month. Saturn recedes from the second star of the Virgin eastwards, and approaches to a small star, which is the seventh of the Virgin; and Jupiter recedes eastward from the first of the Virgin. The position of the heavens, on the 3d of this month, at ten o'clock, is as follows:—

The seven stars of the Great Bear are in the north-west in mid-heaven: the first of the Lion is in the horizon, in the west-north-west: the second star is in the west, nearly twenty degrees high: Saturn below it nearly west-by-south; nearly south-west-by-west, the first of the Virgin and Jupiter are discovered, and high above them Arcturus; more to the south, and higher up than Arcturus, is the Northern Crown, and about the same height as Jupiter is the first of the Balance: near to the meridian is Antares, and a line drawn south-by-west, passes between it and the second of the Scorpion.

Capella is on the meridian in the north, and the four stars of the Lesser Bear are in the western hemisphere, but near to the meridian.

In the eastern hemisphere, near to the meridian, and in mid-heaven, we recognise the first of Hercules and of the Serpent-bearer, and to the east of south-east, but lower down, the first of the Eagle; higher up, but almost in the same line, is the first of the Harp; and, by looking to the eastward of this line, about the same height with the first of the Eagle, we discover the four stars of the Dolphin. If the twilight will permit us, we may now discover, between the first of the Harp and the four stars of the Dolphin, the second of the Swan; and carrying your eye nearly to the east-by-north, you will see a star inferior in brightness, but nearly as far again from the zenith as the first of the Harp, which is the first of the Swan; this being in the tail of the supposed bird, and the second is in the head: the whole constellation will be discovered as the heavens grow darker.

On the 9th, the Moon comes again to our assistance, being seen as soon as the twilight will permit it, very near to Venus, whom she passed this afternoon at fifty-three minutes past five, and of course she will, before Venus sets, be seen nearly midway between this planet and the first of the Lion. On the 10th, the first of the Lion will be seen nearly midway between Venus and the Moon, who, travelling eastward, will on the 11th be midway between the first of the Lion and Saturn, whom she passes on the 12th; and during this her progress we may observe the various groups she forms with Venus, the first, third, fourth, and second of the Lion, and Saturn. On the 12th, she is to the east of Saturn, directing her course to the first of the Virgin and Jupiter, approaching near to them on the 13th, and on the 14th passing the first of the Virgin, and being nearly in the right line passing from the zenith through Arcturus; Jupiter being on the east, and the first of the Virgin to the west of this line. On the 15th, she will have travelled considerably to the eastward of Jupiter, and during this progress we may note the different groupes she makes with Saturn, the first of the Virgin, Jupiter, and Arcturus. On this evening the position of the heavens at ten o'clock is as follows: —

In the north-west is the Greater Bear; in the west Saturn, between five and six degrees only above the horizon. A line drawn from the zenith to the west-south-west, passes by objects now familiar to us; on the west of the line is Arcturus; below mid-heaven, and about seven degrees from the horizon, the first of the Virgin; a little to the south of it, about fourteen degrees above the horizon, is Jupiter; and higher than Arcturus, above mid-heaven, we recognise the stars of the Northern Crown. A little to the west of south-by-west is Antares: about ten degrees above the horizon, and higher up to the west of it, is the second star of the Scorpion; near to the meridian, and in mid-heaven, are the first of Hercules and the first ot the Serpent-bearer. The group formed by the first of the Virgin, Jupiter, Antares, the first of Hercules and the Serpent-bearer, the Northern Crown, and Arcturus, will attract your attention.

In the eastern hemisphere, a line drawn from the zenith to south-east-by-south will direct us to objects now familiar to us. About fifteen degrees from the zenith, the brightness of the first of the Harp will strike us; and lower down than mid-heaven, the first of the Eagle. Rather higher up, but eastward of this star, we recognise the four stars of the Dolphin; and of course, by drawing a line from the Dolphin to the first of the Harp, we discover in midway the second of the Swan: and thence, carrying your eye a little to the north of east, you discover the first of the Swan. Draw a line from the first to the second of the Swan, and near to the first of the Swan the star in this line, of inferior brightness to him, is the third of the Swan. And now a line drawn to the east-by-north, will pass through four stars near the horizon of nearly equal brightness, though at a considerable distance from each other. The star at the east point, about fifteen degrees above the horizon, is the first of Pegasus; that higher up, and more eastward, is the second; the star lower down, and still more eastward, is the third. Higher up, and more eastward still, is the first star of Andromeda. These four stars form the corners of a figure nearly a square.

On the 16th, the Moon is seen about midway between the first of the Balance and Antares: on the 17th, she forms a triangle of nearly equal sides with Antares and the second of the Scorpion: and on this evening there will be an occultation of a small star, which is the sixteenth of the Scorpion. The occultation begins at twenty-five minutes past nine, and the star emerges from the western rim of the Moon at three minutes and a half past ten. At the immersion, the star is thirteen minutes and a third above the Moon's centre; and at its emersion, twelve minutes and three quarters above the Moon's centre. After the occultation, the Moon travels towards Antares, and will pass by and very near to this star early in the morning of the 18th. In the evening of the 18th, she will be seen to the east of Antares, and on the 19th between two stars of inconsiderable brightness; that to the west being the eighth of the Serpent-bearer, and that to the east the third of the Archer. On the 20th, she passes near to the eleventh of the Archer, and of course will be seen to the east of it in the evening. She is now travelling towards a small star, the eighteenth of the Archer, which she passes on the morning of the 21st. On the 22d, she passes the line of the Earth's motion, and being then between the Earth and Sun, eclipses the latter to certain inhabitants of the Earth; but, from our position at that time, the Sun shines upon us as usual. The reason of this will be evident to you from what was laid down in page 55, on the wall, which hides a house from persons in certain situations, but not in others.

On the 25th, the position of the heavens at ten o'clock is as follows. In the north-west the Great Bear; Arcturus in the west-by-south below mid-heaven; higher up, nearly in mid-heaven, in the west-south-west, the Northern Crown; and in this direction, near the horizon, the first of the Virgin and Jupiter. To the west of south-west-by-west, the first of the Balance; and lower down, nearly south-south-west, Antares; his companion, the second of the Scorpion, being to the west of it. In mid-heaven, in direction south-south-west, the first of Hercules and the Serpent-bearer.

The first of the Harp is now near to the meridian in the eastern hemisphere, being about fourteen degrees from the zenith; and rather below mid-heaven, to the south-south-east, the first of the Eagle, the four stars of the Dolphin being higher up in the south-east. A line now drawn from the zenith to the eastern point passes through the square figure formed by the three stars of Pegasus and the first of Andromeda; and a line drawn from the lowest through the highest of these stars will pass nearly through the first of the Swan, which is about midway between the zenith and the highest of the four stars, or the second star of Pegasus. The star most southward is the first of Pegasus; the lowest, the third of Pegasus; and the star most eastward the first of Andromeda. The Moon is now about ten degrees above the horizon in the east-south-east. From this description of the heavens you will form a good idea of their positions to the end of the month, making the due allowance for the motion of the Moon, which will soon be invisible in the evening.

AUGUST, 1804.

THE evening walk is in this month cheered with the return of the reaper from his useful toil, and sheaves of corn stand now in groupes, which excite in a well-bred mind delicious sensations of gratitude to the Benevolent Supporter of all nature. What a profusion of wealth! What a number of beings may now be nourished in comfort, and qualified for labours which might all tend to improve a country, and to make the Earth like the garden of Eden! But no! the time is not come for man to feel his real dignity. He frequently wastes his labour, his thoughts, and the provisions of nature, more in arts of destruction than of preservation: he forgets the high task assigned to him, to rule over and subdue the Earth, that he may have the paltry gratification of lording it for a few moments over his fellow man: he will not bow to the easy yoke of the Prince of Peace, nor invest himself with the dignity which belongs to every Christian. Yet such a season of confusion cannot last for ever. As surely as the world has seen the four great empires marked out in the prophetical word by Daniel, and the last of them is verging to its close, so surely shall succeed the empire of the Son of Man: to him will be paid willing obedience: the Earth shall then pour forth in a tenfold manner its increase, and his God and our God shall give us his blessing. The portentous statue is now tottering on its base; the stone cut without hands is ready almost to strike: the image shall be crushed to pieces, and no vestige shall be left of its abominations*.

During this month the daily height of the Sun on the meridian diminishes faster than it did in July, and it may afford some amusement to observe, by an easy experiment, the rate of this decrease. Take a straight stick about a yard long, and at the end of it make a hole, as is usual for the tassel of a walking stick, only let it be larger. Cross this hole in the direction of the stick: fix on with wax a hair, and across this hair fix on another hair with wax, so that the point where the two hairs cross each other shall be in the centre of the hole. Now fix the stick in the ground, and the hole being at the other end, and placed opposite the Sun, there will be on the ground the shadow of the stick opposite to the Sun, and at the end of the shadow an oval, formed by the rays passing through the hole of the stick; and the centre of this oval will be marked by the shadow of the hairs, which cross each other on the hole of the stick. As the Sun appears to move, this centre will move on the ground; and if you note its motion a little before and after noon, you may mark, with great ease, on the ground a line, which shall run from south to north, or be a meridian line.

---

* See Daniel, chapter the second, and twenty-seventh verse of chapter the seventh. The infidel holds this in contempt; and Christians do not seem, in general, to exult that the time is approaching, when their Lord and Master shall be acknowledged to be Lord and Master by the whole Earth.

To do this properly, draw with a string and a piece of chalk an arc of a circle about eleven o'clock, the string being fixed to the bottom of the stick, and the point of the chalk fixed on the centre of the oval formed in the shadow of the stick. At half past eleven do the same thing; then about half past twelve observe the centre, and you will see it near the arc last made. When it comes upon the arc, mark the place, and draw a line from this place to the beginning of the arc, or the place where the centre was at half past eleven. Divide this line into two equal parts, and a line, drawn from the bottom of the stick through the middle of the divided line, will be the line on which the centre of the oval is, when the centre of the Sun is upon the meridian.

At one o'clock observe the place of the centre, which will now be near the arc first made, and when it is upon the arc, mark the place; and draw a line from this place to the beginning of the arc, or the place where the centre of the oval was at eleven o'clock; then this line, if you have drawn every thing right, will be divided into two equal parts by the line drawn from the bottom of the stick.

If the ground is rough, and the arcs of the circles are ill drawn, the line drawn from the stick will be less exact; but, by trying this play a few times, young persons will grow expert at it, and, instead of making two, they may make several arches. Thus, one at eleven, another at a quarter past, a third at three quarters past, and so on, marking the place where the centre of the oval is, either before or after eleven, and, as its place is changed, making new arcs. Then after twelve, as the centre of the oval comes upon any of the arcs, mark the places; and, joining by lines these places with the beginnings of their respective arcs, you may now bisect the lines, and the line passing through the points of bisection will pass through the bottom of the stick. Thus we shall have, if not an exact meridian line upon the ground, one sufficiently exact to answer our purpose: and we may observe by it, when the Sun is upon this line, and also by marking the spot every day determined by the centre of the oval, we may take notice how its middle-day height is constantly diminishing. This little contrivance might in a school suggest many curious and useful questions.

Round the stick, as a centre, draw a complete circle. Then the meridian line drawn on the ground will cut this circle, and, if produced both ways, will cut this circle in two points, the north and the south points. The other points may be made in it as directed in pages 19, 30, and 39. We may now observe at what point the Sun rises or sets, as there will be marked at Sun rising or setting a point by the shadow of the stick on the circle, and the opposite point to it is the point where is the Sun in rising or setting. Thus, suppose the shadow of the stick at Sun-set to cut the circle at the point south-by-east, then the Sun is setting on the horizon at the point north-by-west. If the shadow of the stick cuts the circle in the point east-north-east, then the Sun is setting on the horizon at the point west-south-west. At any time also during the day, by looking at the shadow of the stick on the circle, you may tell at what point of the heavens the Sun is, and you may notice the unequal time employed in the shadow passing from one point to another. At night the line we have thus drawn will serve as our guide to determine what stars are at any time upon the meridian.

We have now lost the fair star of evening, which had for so many months succeeded to the setting Sun; but there are still two planets in the western hemisphere to awaken our attention; and about the middle of the month Mercury begins to offer some opportunities of being discovered: but the horizon must be peculiarly clear for this purpose, and the observer must fix his attention for about half an hour after Sun-set, in a manner which will scarcely be compensated by the discovery.

On the 5th of this month the Sun is eclipsed by the Moon passing between it and the Earth; but we are not deprived of its light during the time of this occultation to the inhabitants of some other countries. The whole nature of eclipses is simply explained on the same principle as the hiding of a house by a wall, described in pages *55* and *56*; and it may amuse you to substitute a figure of the Sun and Moon, instead of the wall and the house. Draw two circles of equal diameters, and draw a line joining the upper rims, and another joining their under rims. Now one of these circles may represent the Sun, the other the Moon; and since the Moon is a dark body, it will prevent the rays of the Sun from passing into the space between the two lines and the back surface of the Moon. Of course, if a person is placed between these two lines, the Moon being between him and the Sun, he will not see any part of the Sun: but, if he is placed on either side of the two lines, he will see either the whole or part of the Sun. Now draw a line from the upper rim of the Sun to the lower rim of the Moon, and continue it as far as you please: do the same by the lower rim of the Sun, and the upper rim of the Moon. Then a person, standing behind the Moon, between the line connecting the upper rims, and the line connecting the lower rim of the Sun with the upper rim of the Moon, will see only part of the Sun, as you may perceive by drawing a line from a point within the space mentioned to the Sun, and you will perceive that it must pass through the Moon. In the same manner, if a person is placed between the line connecting the lower rims, and the line connecting the upper rim of the Sun with the lower rim of the Moon, he will see only part of the Sun, as you may also perceive by drawing a line from a point within these limits to the Sun, which will be intercepted by the Moon. But a person placed without these limits, namely, any where behind the Moon, not between the line connecting the upper rim of the Sun with the lower rim of the Moon, and the line connecting the lower rim of the Sun with the upper rim of the Moon, will see the whole of the Sun's face. In the eclipse on this day we are in this last situation, and the apparent faces of the Sun and Moon are very nearly of the same dimensions.

The body of the Sun is so much greater than the body of the Moon, that the circles we have thus drawn do not represent accurately the faces of the Sun and Moon; but you will perceive, that if the circle representing the Moon is made less, the only difference will be, that the space deprived of the whole light of the Sun will be made less, by the line connecting the upper rims now meeting the line connecting the lower rims, instead of these lines being parallel. Hence, if a person is beyond that point where these two lines meet, he will see some part of the Sun's face: and of course in eclipses we must consider the magnitudes of the Sun and Moon, as also the distance of the Moon from the Sun, and its distance from the Earth. These things may hereafter afford a considerable fund of amusement.

On the 5th of August, at half past nine in the evening, we may note the following objects in the heavens. In the western hemisphere the Great Bear to the north-west, and Arcturus below mid-heaven in the west: in west-south-west, about mid-heaven, the Northern Crown; and within five degrees of the horizon, Jupiter. Saturn sets about twenty minutes before. In the south-west-by-south, near the horizon, the two first stars of the Scorpion, Antares, or the first, being the lowest, and more to the south: in south-south-west, nearly in mid-heaven, the two first stars of Hercules and the Serpent-bearer, the first of Hercules being the most to the westward.

The first of the Harp is now on the meridian, about thirteen degrees from the zenith.

In the eastern hemisphere we perceive the first of the Eagle about mid-heaven, in south-south-east, and the four stars of the Dolphin more to the eastward: and a line drawn from the zenith to the eastern point passes through the first of the Swan, and the four stars in Pegasus and Andromeda. Of these fours stars, the first of Pegasus is in east-by-south; the second higher up, almost due east; the third, the nearest to the horizon, rather more eastward; and the first of Andromeda in east-by-north, higher in the heavens than the first, but lower than the second of Pegasus. Capella is near the horizon between east-by-north and north-north-east. You may now attempt to discover more of the Swan: the first star being nearer to the zenith than it is to the second of Pegasus, and the second being discovered by the line connecting the first of the Harp and the Dolphin, this second star being nearer to the Harp than the Dolphin. In the line joining the second and first of the Swan, but nearest to the first, is the third, and nearly at equal distances from this third on each side of the line are the fourth and fifth of the Swan, the fourth being the highest. The first is in the tail, the second in the beak, the third in the belly, the fourth in the right wing, and the fifth in the left wing, of the Swan; from the smallness of the four last stars, and the great extent of the constellation, it is not to be discovered without some little trouble.

On the 8th, the Moon will be seen at her first appearance travelling towards Saturn, being now to the westward of him; but on the 9th, she passes him, and will be seen in the evening to the east of him. On the 10th, she approaches to the first of the Virgin, who, with Jupiter, are to the east of her; but she passes them both on the 11th, forming with them and Arcturus a group worthy of notice. On the 12th, she passes the first of the Balance, directing her course to the two first stars of the Scorpion, whom on the 13th she approaches more nearly, forming with them a triangle, whose side is the greatest from the Moon to Antares. On the 14th, she is within a degree of Antares, passing it at nineteen minutes past seven in the evening. On the 15th and 16th her journey lies through inconsiderable stars; and on the 17th she will be upon the meridian, surrounded by the small stars of the Archer, at a quarter past nine, when the heavens will present to us the following appearance:—

In the western hemisphere the Great Bear will be known at once by looking towards the north-north-west; Arcturus is in the west below mid-heaven: the Northern Crown in mid-heaven, in the west-by-south. A line drawn from the zenith a little to west of south-west-by-south, will pass between the two first stars of

Hercules and the Serpent-bearer in mid-heaven, and through Antares, who is within six degrees of the horizon. The first of the Harp is now near the meridian, and about fourteen degrees from the zenith.

In the eastern hemisphere we discover in mid-heaven, in the south-by-east, the first of the Harp; and a little higher, nearly south-south-east, the four stars of the Dolphin. A line drawn from the zenith to the east-by-south passes through the first star of the Swan and the four stars of Pegasus and Andromeda; the first of the Swan being about fifteen degrees from the zenith, the second of Pegasus in mid-heaven, the first nearly in the east-south-east, the third near to the horizon, almost under the second, and in the east-by-north the first of Andromeda.

Carrying the eye from the first of Andromeda to the east-north-east, nearly at the same height, you will perceive a star of nearly equal brightness, which is the second of Andromeda; and more to the north, at the same distance from the second as the second is from the first, is the third of Andromeda. These three stars cannot fail of being known, from being of nearly the same brightness, and at the same distance from the horizon. Carrying your eye onward to the north-east, at the same height with these three stars, a star of similar brightness will strike you, which is the first of Perseus; and lower down, in the north-north-east, you will recognise Capella from its superior brightness. The three stars of Pegasus, the three of Andromeda, the first of Perseus, and Capella, make a pleasing group; and under the three of Andromeda, in the east-north-east, near to the horizon, the return of our old acquaintances, the three stars of the Ram, will afford some gratification.

For some following nights the Moon travels amongst inferior stars, and increasing in brightness, enriches in the evening the eastern hemisphere: she is at the full on the 21st, and for some nights adds to the beauty of the group formed by the stars in Pegasus, Andromeda, Perseus, and Capella. On the 25th, the aspect of the heavens at nine o'clock is as follows:—

In the western hemisphere, in the north-west-by-north, the Great Bear. In the west, Arcturus, and nearly west-by-south, in mid-heaven, the Northern Crown. A line drawn from the zenith to the south-west passes in mid-heaven between the two first stars of Hercules and the Serpent-bearer, and to the south of this line, very near to the horizon, is Antares. The first of the Harp is recognised near to the zenith.

In the eastern hemisphere you perceive in mid-heaven, near the meridian, the first of the Eagle; and rather higher up, but more to the eastward, the four stars of the Dolphin. By drawing a line as usual from these stars to the first of the Harp you will perceive the second of the Swan to be making its appulse on the meridian. The Moon is now under the three stars of the Ram and Andromeda in the east-north-east; and the third star of Andromeda is in the north-east-by-east; and to the north of north-east is the first of Perseus. Capella is nearer the horizon in the north-north-east. If you now draw a line from the zenith to pass between the third of Andromeda and the first of Perseus, you will notice, lower down than either, a star of rather inferior splendour, but superior to that of the neighbouring stars. This is the second star of Perseus, and the small stars near it are with this said to be in the head of Medusa, Higher up, and above mid-heaven, in this line, is a star of equal magnitude, which is the second in the chair of Cassiopeia, though it is the brightest star in that constellation, a singularity which may naturally excite your curiosity, and the stars near it will strike you as forming with it a figure like a W. The three stars in the Ram are near the horizon in the east-north-east. On the last day of the month Mercury may probably be seen setting in the west about an half an hour after Sun-set.

SEPTEMBER, 1804.

THIS month is distinguished by the Sun being in such a position on the 23d, that in the course of twenty-four hours every part of the Earth is visited by his rays; and everywhere, except within the polar circles, the day and night are equal. The twenty-four hours in which this occurs, begin at forty-seven minutes past six in the evening of the 22d, and end at forty-seven minutes past six of the 23d. At forty-seven minutes past six in the morning of the 23d, the Sun is visible to the inhabitants of one half of the globe, from the north pole to the south pole: the inhabitants of the Earth under the north pole are soon to be wrapped up in a darkness of nearly six months duration, the inhabitants under the south pole, if there are any, are rejoicing at the commencement of their six months summer. In both situations their day is lengthened by the power of the air to refract the rays of the Sun, by which it is made to appear above the horizon, when he is really below it. Hence the inhabitants of the north and south poles see the Sun skirting the horizon for several days succeeding and preceding the 23d; to the former he presents at every point of the compass the appearance of the setting Sun: to the latter the appearance of the rising Sun.

A six months' night may seem to you a most dreadful calamity, and your imagination may paint, as in many other cases, scenes of wretchedness, which have no existence in real nature. This night is not enveloped in a dark and horrid gloom; for some time the sky glows with the lively colours of our summers' evenings, and for three months the twilight prevails. The remaining three months are enlightened by the long continuance of the Moon at certain intervals above the horizon; and the clearness of the sky gives additional brilliancy to the stars. There is no situation upon Earth without its natural comforts; and where Providence seems to have poured forth its gifts with the utmost profusion, there man is most wanting to himself, and the Garden of Eden is, from negligence and misrule, turned into a wilderness.

The year originally began in this month, and from the day on which the Sun is in the situation we have described, when the day is equal to the night. The Jews still retain the original calendar, and the beginning of the year is with them a festival. They have erred a little, indeed, from the exact time; but we shall not be surprised at this want of exactness, when we consider, that it is little more than half a century since this island was so full of prejudice, that they would scarcely part with their calendar, though the error in it amounted to eleven days. We derive the beginning of our year, and the names of our months, from the dark ignorance of paganism.

On the 23d, the Sun rises in the eastern, and sets in the western point. Hence, with the figure representing the meridian and horizon, you may perceive the reason of the equality of day and night. For observe the height of the Sun at noon-day, and place s at the same distance from the horizon between Z and S, as the Sun appears to you above the horizon. Join s and E; then the line s E represents the arc described in the morning from sun-rise till noon, and if you complete the meridian line, so that it shall be a circle, the line s E produced will cut this circle at the same distance from E that s is from E. That is, the arc described by the Sun under the horizon, from midnight till Sun-rise, is exactly equal to that described by the Sun from Sun-rise till noon; and in the same manner the arc, described by the Sun from noon till Sun-set, is exactly equal to that described by the Sun under the horizon, from Sun-set till midnight.

The circle described by the Sun on this day is the same as that in which the Earth moves during the course of a year. This circle, from the day and night being equal when the Sun is in it, is called the equinoctial; and if lines were drawn from this circle to the centre of the Earth, they would cut the Earth in that circle, which is conceived to divide it into two equal parts, and is called the equator. The inhabitants of the Earth, who live at the equator, have on this day the Sun directly over their head at noon, and of course have no shadow: and at other parts of the day in the forenoon their shadow is directed to the west, and in the afternoon to the east. During the six following months their shadow is directed to the north, and for the remainder of the year their shadow is directed to the south of these points.

This part of the world was supposed by the ancients to be, from the intense heat of the Sun, uninhabitable. The moderns have found there extensive regions full of people, who bear with the same ease the heat of their day as we do the various changes of our climate. If the heat of the Sun is at all times great in the day time to the inhabitants of the equator, they never see him longer above the horizon than twelve hours, and throughout the year there is no variation in the length of the day and of the night. Another remarkable circumstance is the peculiar opportunity afforded to the inhabitants of the equator, of seeing in the course of the year all the stars that are in the heavens. In this country we can see only five-sixths of the whole number, and the inhabitant of the north or south poles can see only one half of the whole number of the stars.

This will appear manifest to you, by applying to your figure, and making it for an inhabitant on the equator. In this case the pole P will be in the horizon at the point N; and, as every star describes a circle about the pole, it is evident, that every star will be twelve hours above, and twelve hours below the horizon. The Sun and stars all rise and set perpendicularly. The contrary takes place to the inhabitant of the north pole, with whom the point P will coincide with Z, the zenith, or the polar star, will be seen directly over his head; and the Sun and stars, describing circles around it, will, if seen at all, be seen to describe the whole of a circle. Hence the inhabitant of the equator sees the stars rising and setting; the inhabitant of the pole sees the same stars during his long night, which neither rise nor set. The inhabitant of the equator sees all, the inhabitant of the pole sees only half of the stars. The Sun, Moon, and planets appear to the inhabitant of the pole always near his horizon; to the inhabitant of the equator they are all frequently in his zenith. As we approach to the pole, our starry regions become contracted: in approaching to the equator they are enlarged: and hence India is a country peculiarly favourable to astronomical researches. As so much of that country is in subjection to the English name, we may hope that the opportunity will not be lost of rendering it illustrious, by conquests without bloodshed, and acquisitions without avarice.

During the greater part of this month there are two planets at Sun-set above the horizon in the western hemisphere, Mercury and Jupiter. Mercury will scarcely be able to disengage himself from the rays of the Sun, and Jupiter performs the office of the evening star. The Moon will begin to afford us her assistance on the 6th, and at half past eight the heavens will present to our view the following objects:—

In the western hemisphere, below mid-heaven, in the north-west-by-north, the Great Bear; and above the fourth star will be recognised the first of the Dragon; and by drawing a line from the sixth of the Bear through this star, we shall perceive it to pass between the four stars of the Lesser Bear, which are now in the north-north-west. To the north of west, below mid-heaven, is Arcturus, and to the south of west, nearly in mid-heaven, the Northern Crown. A line now drawn from the zenith to the south-west will pass by the first of the Harp; and in mid-heaven, between the first of Hercules and the first of the Serpent-bearer, and to the south of this line, is Antares, within two degrees of the horizon.

Upon the meridian is the second star of the Swan.

In the western hemisphere, near the meridian in mid-heaven, the first of the Eagle; and to the eastward of it the four stars of the Dolphin. A line drawn from the zenith to the east passes through the first of Andromeda, and of course we look to the south of this line for the three stars of Pegasus, which make with it a figure like a square; and to the north of this line are the second and third of Andromeda. A line drawn nearly east-north-east passes through the second of Andromeda, and nearly through the first of the Ram. In the north-east we discover the first and second of Perseus, and above them Cassiopeia's Chair; and in the north-north-east Capella, the star more northerly, but of inferior brightness, being the second star of the Waggoner. The group formed by the stars in Pegasus, Andromeda, Perseus, Capella, and Cassiopeia, give a brilliant appearance to the eastern hemisphere.

On the 7th, the Moon is seen to the west of Jupiter, being between Jupiter and the first of the Virgin. On the 8th, she passes Jupiter and the first of the Balance, being seen below the latter whilst she is above the horizon, and nearly in a line with it and the second of the Balance, which is about ten degrees from the first of the Balance. A line drawn through the Moon and the first of the Balance will meet another line, drawn through Antares and the second of the Scorpion, in the second of the Balance. On the 10th, she approaches near to Antares, and on the 11th is seen near to, but to the eastward of this star. On the 12th and 13th, she passes her time among inconsiderable stars; and on the 14th is on the meridian at five minutes past eight, when the appearance in the heavens will be the same as described for the evening of the 6th, except that the Moon adds to the beauty of the group formed by Arcturus, the Crown, the first and second of Hercules and the Serpent-bearer, the first of the Eagle, the Dolphin, and the first of the Harp. On the 15th, she is on the meridian at five minutes before nine, when we may make the following observations on the heavens: —

The four stars of the Greater and Lesser Bears are in the north-north-west; Arcturus near to the horizon, to the west of west-north-west: rather below mid-heaven, in the west, the Northern Crown; and at the same height in the south-west-by-west the first star of Hercules and the Serpent-bearer; the first of the Harp being above them, as much higher above mid-heaven as they are below it. In the south-by-west is the first of the Eagle, and a little below it its companion, though of much inferior splendour, the second of the Eagle.

The third of the Swan is now on the meridian; the first being in the eastern hemisphere, but very near to the zenith. The fourth star is in the western hemisphere, a little above the line joining the first of the Harp and the first of the Swan: the fifth star is in the eastern hemisphere. The Dolphin is now almost upon the meridian.

A line drawn to the east-south-east introduces us to the stars in the square of Pegasus and Andromeda, the highest or second of Pegasus being as much above, as the lowest, the third, is below mid-heaven. To the south-east by-east is the first of Pegasus, lower down than the first of Andromeda, which is in the east-by-south. In east-by-north we recognise the three stars of the Ram, and above them the second of Andromeda; and in north-east-by-east, by drawing a line down from the zenith to the horizon, we first perceive Cassiopeia's Chair above mid-heaven, and rather below mid-heaven, on the east of this line, the third of Andromeda, and to the north of the line the first of Perseus: below them the second of Perseus, and the small stars in the Medusa's Head. In north-east-by-north, still lower, Capella; and a little more to the north, the second of the Waggoner. The group, formed by Pegasus, Andromeda, the Ram, Perseus, the Waggoner, and Cassiopeia's Chair, gives a great degree of splendour to the eastern hemisphere from the south-east to the north-north-east.

On the 16th, the Moon appears about three degrees above two small stars, which are the third and fourth of the Water-bearer; and on the 17th she passes the seventh of this constellation at a quarter past seven, being then within a degree below it. Her journey is now through space thinly scattered with stars:

on the 18th we may discover a small star about five degrees from her, which is the third of the Fishes; and on the 19th she will be under the four stars of Pegasus and Andromeda, directing her course evidently to the three stars of the Ram. On the 20th, she will be seen to have passed the third of Pegasus, and to be nearly midway between this star and the Ram, whom she will approach very nearly on the 21st, being at ten o'clock at night within three degrees of the third of the Ram. Hence, if this constellation has hitherto evaded your researches, which is scarcely possible, to-night you will see the Moon, the third and the second of the Ram nearly in a straight line, and the first star of the Ram brighter than the other two, and somewhat more eastward. At this time, a line drawn from the first of Andromeda through the Moon, will meet a line drawn from the second of Andromeda through the first of the Ram, near a bright star, which is the first of the Whale. On the 22d, the Moon is seen midway between the first of the Ram and the Pleiades; and a line, drawn from the third of Andromeda through the Moon, will pass very near to the first of the Whale. On the 23d, she passes at seventeen minutes past seven the seventh of the Pleiades, being then about a degree from this star, and of course she will be seen during the night to the east of this star. At ten the heavens, to the east-by-north, will present a splendid appearance, from the group formed by Aldebaran, the Moon, the Pleiades, the Ram, the stars in Andromeda, Cassiopeia, Perseus, and Capella.

On the 25th, the aspect of the heavens at half past eight is the same as that described for the 15th, at five minutes before nine; and at half past nine we may notice the following objects:—

In the north-north-west, below mid-heaven, the Greater Bear, the two first stars being near to the meridian: a line drawn from the zenith to the sixth star passes nearly through the third of the Lesser Bear and the first of the Dragon. Arcturus is now in the horizon to the west of north-west-by-west; and the Northern Crown half way between mid-heaven and the horizon, to the west of west-north-west. A line, drawn from the zenith to the bright star in the Northern Crown, passes near to two bright stars above mid-heaven, which are the third and fourth of the Dragon; the third being the highest, and to the westward. In west-by-south, below mid-heaven, are the two bright stars, the first of Hercules and the first of the Serpent-bearer: above them we shall easily distinguish the first of the Harp above mid-heaven; and now a line, drawn from the zenith to the south-west-by-west, will pass nearly through the first, third, and second of the Swan, the first being about ten degrees from the zenith. In the south-west-by-south, near mid-heaven, is the first of the Eagle, and higher up, but more to the south, the four stars of the Dolphin.

In the eastern hemisphere we may perceive, about six degrees from the horizon in south-by-east, a star of the first magnitude, which is the first of the Southern Fish: a line, drawn from the zenith to south-east-by-south, passes through the four stars of Pegasus and Andromeda, nearly in mid-heaven; and a line, drawn to the east-by-south, passes between the first and second of Andromeda near mid-heaven, and to the south of the three stars of the Ram and the first of the Whale; the latter being ten degrees from the horizon, and the first star of the Ram being midway between the second of Andromeda and the first of the Whale. Nearly in the east-north-east, and near to the horizon, is Aldebaran; above it, the Pleiades; and nearly midway between the Pleiades and the zenith, the third of Andromeda: a line, drawn from the zenith to north-east-by-east, passes through Cassiopeia's Chair and the first of Perseus; the latter being below mid-heaven, and the former nearer to the zenith than the middle point between the zenith and the first of Perseus. To the east of this line we mark the second of Perseus below it; and to the north of it, still lower down, Capella with his companion. The second star of the Bull is near the horizon to the north of this line. The group, formed by Aldebaran, the Hyades, the second of the Bull, Capella and his companion, the first and second of Perseus, and the Pleiades, fix our attention between the east-by-north and north-east-by-north points. Aldebaran, the Pleiades, the three stars of the Ram, and the first of the Whale, form a group of inferior splendour between the east-by-south and east-north-east points. Above them we shall naturally fix our attention on the four stars in the square of Pegasus and Andromeda, and thence proceed to the second and third of Andromeda, and by Perseus to Capella.

OCTOBER, 1804.

DURING this month we may observe, by the shadow of the stick, that the Sun's noontide height daily decreases, and that it rises in the morning to the south of east, and sets to the south of west. Hence the length of the day is daily decreasing, and is always less than the length of the night. The Sun is high enough above us in the day time to give a considerable degree of heat; but, during its absence, the cold begins to prevail, and if it were not that the Earth retained the heat of the summer months, the nights would be very cold at the end of the month, and we might experience the beginning of the severity of winter. As the Sun rises and sets to the south of the eastern and western points, our shadow is always to the north of those points; and in this we differ from the inhabitants of the opposite parts of the Earth, whose shadow is now always to the south of the east and west points.

This you will naturally expect from the consideration of the meridian figure; for if the inhabitant of the pole sees the Sun going round him in the course of twenty-four hours, he has his shadow directed, during those hours, to every point of the compass ; and the inhabitant of the equator has, during two days of the year, his shadow directed due east and west. Of course the inhabitants of the countries between will, as they live nearer to one or other of these positions, approach to the property belonging to these positions. They, who live near to the north pole, have their shadows directed to every point of the compass, because the Sun for a certain number of days never sets to them: they, who live near to this region, but to whom the Sun is never twenty-four hours above the horizon, will have their shadows directed to certain points only of the compass: as we approach to the equator, the Sun is at its rising and setting less distant from the east and west points, and consequently the shadows made by it will be directed to fewer points of the compass.

The inhabitants of the equator are either without shadow, or the shadow is directed to the east and west points, or to points between twenty-three degrees and a half from each of these points. The other inhabitants between the tropics are twice in the year at noon without shadow, and have their shadows sometimes directed to the north, at other times to the south. The inhabitants of the temperate zones have their shadows directed in such a manner, that in the north temperate zone their shadow can never be directed to the south, nor the inhabitants of the south temperate zone have theirs directed to the north.

We may represent this by easy figures. For the inhabitant of the equator we place the poles in the horizon, and as the Sun describes half circles every day, it will be seen, that at whatever point he rises in the east, in the same point he sets in the west, and his utmost limit at rising or setting from either of these points is twenty-three degrees and a half. For the inhabitants at a distance from the equator, the height of the pole above the horizon is equal to their distance from the equator: and where the temperate zone just begins, the pole is twenty-three degrees and a half above the horizon. In this situation the Sun does not on every day describe half circles; but the arcs described grow larger and larger till Midsummer day, when the Sun rises at a point more than twenty-three degrees and a half from east. As you make figures with the pole higher above the horizon, you will perceive, that on Midsummer-day the point of rising and setting will be still farther removed from the east and west points.

Capella we have seen in the north, and near the horizon, consequently it is one of those stars that never set, and you may now determine precisely in what portion of the heavens the stars are that never set. The height of the pole above the horizon in any place is exactly equal to the latitude of the place, or the distance of the place from the equator. Now no star that passes the meridian between the pole and the northern point of the horizon, sets to those persons who live north of the equator; consequently all those stars, which are not farther from the pole in degrees of the Heaven, than the place is in degrees of the Earth from the equator, never set to the inhabitants of that place.

From these properties of the stars you will naturally conclude, that they have been made useful in some measure to the inhabitants of the Earth. The polar star was the great guide to navigation in ancient times. At present, by measuring its height above the horizon, the sailer knows his latitude, or distance from the equator: but he may do this also by the height of any other star above the horizon, when it is in the meridian. For we have now books with the distance of the stars from the poles written down: and if the meridian height of any star above the horizon is known, the height of the polar star is also known, and from that, as before, the latitude of the place.

Your figure will show this to you: let s represent the place of a star on the meridian, which must be either between the pole and the north point, or the pole and the south point. Let it first be between the pole and the north point; and let its height above the horizon be thirty degrees, and its distance from the pole twenty degrees. Then the height of the pole is fifty degrees, and that is the latitude of the observer. Now, suppose the star to be between the pole and the south point, and let its meridional height be sixty degrees above the horizon, and its distance from the pole fifty degrees; then the arc between the pole and the south point is a hundred and ten degrees, and of course the distance of the pole from the northern point is seventy degrees, which is the latitude of the observer. If the star is supposed to be between the zenith and the pole, and its meridional height to be seventy degrees, and its distance from the pole thirty degrees, then the latitude of the observer is discovered with equal ease: but the process I leave to your investigation.

In the same manner at noon day the latitude of a place is discovered by the height of the Sun on the meridian. For the distance of the Sun at noon from the pole is marked down for every day of the year; and consequently, when the height of the Sun at noon is measured, and its distance from the pole is known, the latitude of the place will be found from the Sun in the same manner as it was by means of a star. In an island like ours, these ideas cannot be made too familiar to young people; as in a future time, persons, so brought up, will with ease and readiness perform those more difficult calculations, by which the latitude and longitude of a ship at sea may be discovered.

In this month we nearly lose the opportunity of seeing a planet. Jupiter in the end of the month sets so near the Sun, that he will be scarcely visible. The Moon in the beginning of the month is not visible, but soon comes to our assistance, and to those who can leave their beds to look at the stars, she presents on the 21st an opportunity of observing an occultation. At eight minutes and a half past four in the morning the seventh of the Pleiades will touch the Moon's eastern rim a little below the Moon's centre; and at fifteen minutes and a quarter past five in the morning, we shall perceive the star emerge a little to the north of the centre.

On the 1st of this month the aspect of the stars will be, at five minutes before eight in the evening, the same as described for the *25th* of last month at half past eight. The Moon on the 6th will be seen below the first of the Balance, directing her course to Antares, to whom she will have approached very near are higher up, and more to the south. We may now take notice of two stars accompanying the first of the Eagle; the farthest off, or the second of the Eagle, being below, but little more than two degrees from it; the third is higher up, but not two degrees from the first.

In the eastern hemisphere we pereeive, near the meridian, but above mid-heaven, the first of Pegasus, and of course are directed by him to the second, which is higher up, but at an equal distance from the meridian. In the south-east, but lower down, is the first of Andromeda, and to the south of it, but lower down in mid-heaven, the third of Pegasus. The position of these stars will, from their making a square, easily discover them to us. The three stars of the Ram are below mid-heaven in the east-south-east, and direct us to draw a line through them from the zenith to the horizon, by which we shall discover, at equal distance from them, the second of Andromeda above mid-heaven, and the first of the Whale near the horizon. Both these stars are of equal brightness, and brighter than the star about three degrees to the west of the first of the

Whale, which is the third in that constellation. The Pleiades are to the north of east, and in the line between them and the zenith we distinguish, by its superior brightness, the third of Andromeda. In east-by-north, but near the horizon, we recognise Aldebaran, with his companion the Hyades. A line, drawn from the zenith to the east-north-east, points out first to us Cassiopeia's Chair near to the zenith; in mid-heaven, the first of Perseus; lower down, but to the southward, the second of Perseus, with the small stars in the Medusa's Head; and higher up than Aldebaran is the second of the Bull. Having now sufficiently distinguished the first of Perseus, you may notice a star of inferior brightness within five degrees above him, which is the third of Perseus; and within four degrees below him a star of the same brightness as the third, which is the fourth of Perseus.

Capella cannot fail of striking us in the north-east-by-east, with his companion about eight degrees more to the north. We may now notice near Capella three smaller stars, his constant companions; that about three degrees and a half below him is the fifth of the Waggoner, and the two stars, about three degrees below the fifth, are the sixth and seventh of the same constellation, the sixth being the most southernly.

On the 9th, the Moon is seen to have travelled considerably from Antares, and on the 10th directing her course through some small stars which are in the Archer. On the 12th, the aspect of the heavens at twenty-five minutes past seven is the same that it was on the first at five minutes before eight, and at a quarter past nine the same that it was at half past nine on the 8th.

On the 16th, the Moon is on the meridian at six minutes past ten, when we may note the following appearances:—

The Great Bear is in both hemispheres; the third star being on the meridian in the north, the first and second in the eastern hemisphere, and consequently the remainder of the seven stars in the western hemisphere. A line, drawn from the zenith to the north-north-west, passes through the four stars of the Lesser Bear in mid-heaven: and to the north of this line, between these four stars and the sixth of the Greater Bear, you distinguish the first of the Dragon. To the west of north-west is the Northern Crown near the horizon: above it, but below mid-heaven, the second and third of the Dragon, the second most westernly, and the distance between them about four degrees. In the west-north-west, below mid-heaven, is the first of the Harp, and near the horizon the two first stars of Hercules and the Serpent-bearer. The group formed by the Northern Crown, the second and third of the Dragon, the first of the Harp, and the two first stars of Hercules and the Serpent-bearer, will strike your attention. In the west we may now easily mark out the Swan, the third star being in mid-heaven, the first being six degrees above it, and the second being at the same height as the first of the Harp; the fourth nearly midway between the first of the Swan and the Harp; and the fifth between the first of the Swan and the Dolphin, but nearest to the first of the Swan. In west-south-west we discover the first of the Eagle, accompanied by the third higher and more westernly; and the second lower, and a little more to the south. For the Dolphin, of course, we look higher up, and perceive its four stars in south-west-by-west. The first star of the Southern Fish is in south-by-west, near the meridian and horizon.

Above mid-heaven, near the meridian, we now see the four stars in square of Pegasus and Andromeda, the second and first of Pegasus being in the eastern, the first of Andromeda and the third of Pegasus in the western hemispheres. Cassiopeia's Chair is in the eastern hemisphere near the zenith. The meridian thus presents to our view some brilliant objects: in the north, the Greater Bear; near the zenith, Cassiopeia's Chair; and above mid-heaven, the four stars in square.

A line, drawn from the zenith through the first of the Ram will pass very nearly through south-east-by-east. The first of the Ram is in mid-heaven; and midway between it and the zenith is the second of Andromeda; and nearly midway between the first of the Ram and the horizon is the first of the Whale. A line, drawn from the zenith to the eastern point, discovers to us near the horizon the third and first stars of Orion; higher up, but to the south of this line, is Aldebaran; and still higher and more southernly the Pleiades. Nearly in mid-heaven the second of Perseus, surrounded by the small stars in the Medusa's head; and higher up, at nearly equal distances from it on each side of the line, the third of Andromeda and the first of Perseus; the first of Perseus being to the east. Turning more easterly, we perceive, nearly in mid-heaven, Capella and its companions; and below them, near the horizon in the east-north-east, the third of the Twins; and higher up in the north-east the two first stars in the Twins.

On the 17th, the Moon is seen to the east of the line drawn through the first of Andromeda and the third of Pegasus. On the 18th, she has advanced towards the three first stars of the Ram, being nearly midway in the line drawn from the third of Pegasus to the first of the Whale; the small star about two degrees above it is the third of the Fishes. On the 19th, she is under the first of the Ram, and within five degrees of it. On the 20th, she is seen approaching to the Pleiades, of whom the seventh suffers an occultation the next morning; and in the evening of the 21st she is seen midway between the Pleiades and the second of the Bull, the first, or Aldebaran, and the Hyades being under her.

The aspect of the heavens this evening, at a little before seven, is the same as on the 15th of September at five minutes before nine: and at a little before ten, the same as on the 16th of this month at six minutes past ten.

On the 22d, the Moon is seen to the east, but within four degrees of the second of the Bull; and on the 23d, she is within a degree of the fifth of the Twins, and approaching to the two first stars, being almost midway between the first of the Twins and the first of Orion. As her passage lies within the figure formed by Aldebaran, the second of the Bull, the first, second, and third of the Twins, and the first and third of Orion, the various groupes she forms with them will be viewed with pleasure, and then Capella and its companions add to the brilliancy of the picture. On the 24th, she has passed the Twins, and on the 25th the aspect of the heavens at half past nine is the same as on the 16th at six minutes past ten: at half past eight, the same as on the 8th of this month at half past nine: and at half past six, the same as on the 15th of September at five minutes before nine.

From these aspects we may determine the positions of the heavens for the remaining evenings of the month, or correct them by the appearances laid down for the 1st of November.

NOVEMBER, 1804.

THE stars you have seen may not only be made the means of rational amusement to us, but are of use in determining the position of places of the Earth. By them we can tell our distance from the equator: but, as many other persons are at the same distance, this would be of little use, unless we could tell also in what part of this circle, equally distant from the equator, we are living. The stars are again our guide. All persons living in this circle see the same stars, but at different times of the night: and, if we have a method of discovering at what time of the night a person in another place sees that star on the meridian at nine o'clock, which we saw at eight o'clock, we know his position with respect to us.

For the Earth turns round in twenty-four hours, and this makes every star appear to turn round us in twenty-four hours. When we see a star on the meridian, the inhabitants of the same circle with us either do not see it at all, or see it to the east or west of the meridian. If they see it to the east of the meridian, and in an hour's time after see it on the meridian, then they have, by the motion of the Earth, been carried in that time through one twenty-fourth of the circle in which they live. But a twenty-fourth part of a circle is fifteen degrees, and therefore every inhabitant of the Earth is made to move in an hour through fifteen degrees, and in a minute of time through a sixtieth part of fifteen degrees, or one quarter of a degree, that is, fifteen minutes of a circle.

Hence, if we know the difference of time between two places in the same circle, we can tell their position with respect to each other. For, if it is noon with us, and eleven o'clock at another place, then the persons living in that place must be moved through fifteen degrees, before the same object in the heavens will be on the meridian to them; and as the Earth moves round from west to east, these persons are fifteen degrees to the west of us, or, as it is said, they live in fifteen degrees west longitude. If it were twelve o'clock with us, and one o'clock in another place, then the persons in that place are living in fifteen degrees of east longitude.

Thus, we may make a globe to represent the Earth, by taking a point in it to represent the north pole. Then make circles round this point as a centre, and fix one place, London for example, as the place whence the position of all others may be determined. Then the line, drawn from the pole through London, may be continued all round, till it comes to the pole again, and this line will represent the meridian of London. All persons living on this line in one half of the circle, namely, the half of the circle from the pole in which London is, will have the Sun in their meridian at the same time: but to persons living in the other semicircle, it will be midnight when it is noon in London.

At the distance of ninety degrees from the pole draw a circle round it, which will be the largest on the globe. This circle represents the equator; and it may be divided into twenty-four equal parts, beginning from the line passing through London. Then mark each part to the right, or east of London, by the numbers one, two, three, &c. in succession, to twelve; and draw lines from the pole to these points, and all the persons living in these lines will reckon their time one, two, three, &c. o'clock in the afternoon, when it is noon in London.

After the point marking twelve, set off, as before, the numbers one, two, three, &c. to twelve, and the line passing through the point of twelve, will pass through the meridian and London. Hence, beginning from the line passing through London, and counting eastward, we come to the places where it is one, two, three o'clock in the afternoon, or midnight; and from midnight we pass through the places where it is one, two, three o'clock in the morning, till twelve o'clock at noon.

The persons, living between any two of the lines thus drawn, will mark their time by some part of the hour between the two hours, pointed out by these lines. Thus, if a line, drawn from the pole through any place, cuts the equator between the points denoting one and two o'clock, exactly midway between them, then it is half an hour past one at that place: and if we divide the space on the equator between two lines into four parts, then each part will represent a quarter of an hour; and lesser subdivisions may be made.

Knowing, then, what time of the day it is in any place, we can find, between what lines on our globe, drawn from the pole, it must be: and we ascertain the line passing through it by the number of minutes past the hour. If the latitude also is known, then we mark from the pole as many degrees upon the arc made from it passing through the place, as we have found from its latitude, that its distance is from the pole; and thus looking at our globe, we see in what situation, with respect to London, the place is; and this may be done till the globe shall give a person a very good notion of the position of seas, islands, headlands, towns, and countries upon the Earth.

Again, if in any part of the world we have a globe thus made, and know our position upon it with respect to London, we can, at any hour of our day, tell what o'clock it is at London. But the difficulty is, to find out what o'clock it is at London without knowing our position on the globe, and thence determining where we are. Thus, suppose a ship to have been several weeks on the Atlantic, and to have been driven about by so violent a gale, that its reckoning is very little to be depended upon, then how is it to find out its situation? The stars come in to her assistance. The Astronomer Royal provides the world with tables every year, and excellent rules to direct the sailer in the use of them. In these tables he marks the hour of the day, when the Moon shall be at a certain distance from certain stars. The sailer, therefore, if the Moon is above the horizon, and the sky is clear, may measure its distance from some one of these stars, and, looking at his table, will know what o'clock it is at that time at Greenwich. Looking then at his own watch, he knows what o'clock it is in the ship's place, and the difference of time is the ship's longitude from Greenwich.

Suppose the sailer to see the Moon and the first of the Eagle above the horizon at eleven o'clock at night by his watch. He measures the distance between the Moon and this star, and finds it to be eighty-four degrees fifty-two minutes; and, looking at his table, he finds that when the Moon is at this distance from the star it is midnight at Greenwich. Being in the Atlantic he is to the west of Greenwich, and the difference of time being one hour, he knows that he is fifteen degrees west longitude of Greenwich. Thus the use of the stars is very great, and may save many a fine ship from destruction. Mothers, whose sons are designed to go to sea, cannot therefore too often make it their amusement to point out the principal stars, and thus prepare them for one of the most important services in their future life.

A mother may, also, by a pleasant amusement, make the daily motion of the Earth very familiar to her children. When the oranges come upon table, she may take one of them, and holding it between the thumb and fore finger of her right hand, so that the thumb shall be on the place where the orange grew to the twig, and the finger on the opposite point, she may turn with her left hand the orange round and round, the middle finger of the left hand being underneath the orange, and drawn from the right hand. The point, where her fore finger is, she will call the north pole of the orange;

and the point where the thumb is, she will call the south pole of the orange. The line directly under the fore finger and thumb is the meridian: the part to the right hand of this line is the eastern, and to the left hand is the western hemisphere. She may now cut the rind of the orange with a knife from the point of the fore finger to the thumb in twenty-four places, each cut being as nearly at equal distances from the cut on each side as her eye will permit her to judge. Then taking a point at little more than a third of a semicircle from the north pole, let it represent London: and she may show how London goes round her fore finger, describing a smaller circle than places at a greater distance from London. Taking a point at equal distances from the two poles, or from her fore finger and thumb, by holding her knife properly, she will cut the orange so, that the circle will be at equal distances from finger and thumb: this she will easily make the children perceive to be the greatest of the circles, in which a point can move round, and this she will call the equator. To go from London to the south pole she will shew them, that they must cross the equator: and, when they hear of a place being south of the equator, she will tell them, that it must be on their orange between their thumb and the line drawn upon it for the equator. She will speak of these lines every day to her children; and, as they grow up, the ideas of north pole, south pole, equator, and meridian, will be perfectly familiar to them.

But to come to our evening's amusements in the heavens for this month. The stars and the Moon are now the only objects to call our attention, for all the planets are under the horizon. The Moon is too near the Sun for the first days of the month to afford us any assistance, and many cloudy nights will probably deprive us of the light of the stars; the rain, however, which falls before evening, makes the sky remarkably clear, and gives to them a greater brilliancy.

On the evening of the 1st, the aspect of the heavens at six o'clock is the same as on the 15th of September at five minutes before nine: at eight, the same as on the 8th of October at half past nine: at five minutes past nine, the same as on the 16th of October at six minutes past ten.

The Moon affords us but little assistance in the early part of this month, being very near the horizon at her appearance for several nights, and passing through a region thinly scattered with stars. On the 4th, she sets near to, but to the east of Antares. On the 5th, she is seen under and within two degrees of the eighth of the Serpent-bearer. On the 6th she is about five degrees above the third of the Archer. On the 7th she is surrounded by small stars in the Archer. On the 8th, she is seen below the first and second stars of the Goat, being as much nearly to the west of them as she will on the 9th be to the east of them. On the 10th, she will be on the meridian, but very low, at twenty-three minutes past six, when we may mark to the east of her, but much higher up, the four stars in square of Pegasus and Andromeda; and to the west of her the first of the Eagle, and the four brilliants of the Dolphin.

At twenty-five minutes past five, the aspect of the heavens is the same as on the 15th of September at five minutes before nine: at twenty-five minutes past seven, the same as on the 8th of October at half past nine: at twenty-eight minutess past eight, the same as on the

16th of October at six minutes past ten; and at ten o'clock, the eastern hemisphere reminds us of its brilliancy in the beginning of the year.

The sixth of the Bear is now in the meridian in the north; and in the south the second of Andromeda is about seventeen degrees from the zenith.

In the north-by-west the Lesser Bear is below mid-heaven, and still lower the first of the Dragon. In the north-west, about the same height with the first, are the second and third of the Dragon. A line, drawn from the zenith to the point north-west-by-west, passes near the second of Cassiopeia, within ten degrees of the zenith and the first of the Harp, below mid-heaven. To the west of west-north-west in mid-heaven is the first of the Swan, whence the whole constellation may be easily discovered. To the south of west is the first of the Eagle near the horizon, and, of course, higher up in west-by-south, the four stars of the Dolphin. The four stars in square of Pegasus and Andromeda are near mid-heaven, between south-west-by-west and south-south-west. The first star of the Fish is near the horizon to the west of south-south-west.

In the eastern hemisphere we perceive Orion rising with his usual splendour in the east-south-east. A line, drawn from the zenith to the south-south-east, passes near the third of Andromeda near the zenith, the first of the Ram above mid-heaven, and the first of the Whale below mid-heaven. Lower down in the south-east is the third of the River, inferior in brightness to, but rather higher than the second of Orion. A line from the zenith to the south-east-by-east passes through the Pleiades above mid-heaven; below whom, we, of course, mark Aldebaran, and lower still Orion. We may observe, that the first of Perseus, Aldebaran, and the second of Orion, are in a line, Aldebaran being nearest to the second of Orion. Capella is rather above mid-heaven in east-by-north, and the line between it and the first of Orion passes to the east of the second of the Bull, which is at nearly an equal distance from each star. In east-north-east, about twenty degrees above the horizon, are the two first stars of the Twins; and a line, joining the first of Orion and the second of the Twins, passes through the third of the Twins, which is nearest to the first of Orion. The five first stars of the Great Bear are in the north-by-east.

On the 11th, the Moon is on the meridian at nine minutes past seven, the first star of the Southern Fish being at that time near the meridian and the horizon below her to the east; and the star five degrees above her is the third of the Water-bearer. On the 12th, she is on the meridian at fifty-five minutes past seven, the first of the Fish being now to the west of her, and about nine degrees above the horizon. This star, the first and second of Pegasus, are in a line very near to the meridian. On the 13th, she is on the meridian at forty-two minutes past eight, having above her in the same line the third of Pegasus and the first of Andromeda, the first of the Southern Fish being near to the horizon in south-south-west. On the 14th, she is on the meridian at thirty-three minutes past nine, when a line, drawn from the third of Pegasus through the first of the Whale, will pass through her, and being continued through the second of Orion: above her is the second of Andromeda. On the 15th, she passes the meridian at twenty-seven minutes past ten, when she is within two degrees of the third of the Ram, the first being above her, and nearly on the meridian; and higher still, within ten degrees of the zenith, is the third of Andromeda. Fifteen degrees below her is the first of the Fishes, and nearly at the same height, to the south-south-east, the first of the Whale. A line now drawn from the Moon to the first of the Whale will, if produced, pass through the third of the River, the first of the Whale being midway between them.

On the 16th, the Moon is seen directing her course to the Pleiades, being about midway between them, and forming a beautiful group with the Ram, the second of Perseus, the Pleiades, Aldebaran, and the first of the Whale. On the 17th, she passes the Pleiades, and is seen very near but to the east of them at her first appearance, when Aldebaran will be in the middle of the line between her and the third of Orion. On the 18th, she is approaching to the second of the Bull, and passes the line between the first of Perseus and the first of Orion. On the 19th, she is to the east of the third of the Bull, having passed the line between that star and the third of the Twins: on the 20th, she passes the line between the first and third of the Twins, and within a degree and a half of the fourth of the Twins, at eight minutes past eight; and at a quarter past ten the heavens will present to us the following objects:—

On the meridian the first of the Ram, the third of Andromeda, and the first of the Dragon: the first of the Ram fifteen degrees above mid-heaven in the south: the third of Andromeda about ten degrees from the zenith: and in the north, half way below mid-heaven, the first of the Dragon.

The Lesser Bear is below mid-heaven in north-by-west; and still lower, in north-west-by-north, the second and third of the Dragon. A line, drawn from the zenith to the north-west-by-west, passes between the first of the Harp and the Swan and Cassiopeia: the first of the Harp being near the horizon, the Swan below mid-heaven, and Cassiopeia near to the zenith. The four stars of the Dolphin are near to the horizon in the west; and to the north of them, but much lower, the first of the Eagle. In south-west-by-west in mid-heaven are the four stars in square of Pegasus and Andromeda, the first of Andromeda being the highest. For the second we look to the south-south-west, but higher up; or we may discover it by drawing a line from the first to the third.

To the south of south-south-east, below mid-heaven, is the first of the Whale; and to the east of this line, but near the zenith, the second of Perseus. The Pleiades are in mid-heaven in south-east-by-south, which, of course, leads us to Aldebaran lower down, and the whole constellation of Orion is seen beneath it in south-east-by-east, the star lower down, and more to the east than the second, being the seventh of Orion. A line now drawn from the zenith to the east passes between objects familiar to us. Near the zenith, the first of Perseus; below it, to the east of the line, Capella above mid-heaven; to the south, the second of the Bull; lower down, the third of the Twins; and near the horizon, the two first stars of the Lesser Dog. To the east of east-north-east, below mid-heaven, are the Twins, and in the north-north-east the Greater Bear.

At a quarter past nine, the aspect of the heavens is the same as on the 10th at ten; at a quarter before eight, the same as on the 16th of October at six minutes past ten; at twenty minutes before seven, the same as on the 8th of October at half past nine.

On the 21st, the Moon is seen to the east of the Twins, and she is making her way to the first of the Lion; but will now rise too late to afford us her usual assistance. The positions last given may serve us till nearly the end of the month, when they may be corrected by the observations made on the 1st of December.

DECEMBER, 1804.

THE last month of our year is distinguished by the Earth being nearer to the Sun than at any other time; and its noontide height is also less in this than in any other month. These two events take place on the 22d, from which day, as the stick will show you, the noontide height of the Sun daily increases, and the Earth makes daily nearer approaches to the Sun. The difference of the noontide height of the Sun on this day, and on Midsummer day, is forty-seven degrees, and, of course, the rays of the Sun cannot strike the ground with so much strength in winter as in summer.

Now the difference of the distances of the Sun on these two days is not very great, in comparison of the whole distance from the Sun; and hence, though the Earth is nearer to the Sun in winter than in summer, its heat is to us the greatest in the latter season. You may, any morning at breakfast, make this clear to your imagination, whilst you are holding a piece of bread to toast by the fire. If it is held upright before the fire, it will soonest be toasted; and, as you incline it towards you, the part nearest to the fire will be burnt, when that nearest to you is scarcely heated. According to the degrees of inclination the effects will be different, and these degrees of inclination may show you the effects of the rays of the Sun on different regions of the Earth.

When the toast is held upright, the heat of the fire strikes it in the strongest manner: and so does the heat of the Sun strike those parts of the Earth where it is directly over the heads of the inhabitants. When the toast is inclined, then it receives the heat of the fire in the same manner as the other regions of the Earth do the heat of the Sun at noon. In summer time the Earth is farthest from the Sun; but the inclination of the rays of the Sun on our country is represented by the action of the fire on toast, held nearly in an upright state. In winter the earth is nearer; but then the rays of the Sun strike our country as the fire does the toast, when it is held in a posture very much inclined. They who live in the southern part of the Earth have, during our winter, the Sun nearer to them, and also its rays striking them more forcibly; and in summer they are not only farther removed from the Sun, but also his rays strike them in a less forcible manner. Hence their summer ought to be hotter, and their winter colder, than ours: but so many other causes interfere in the production of heat and cold, that this little difference affecting the power of the Sun's rays is of little consequence. Another circumstance, which makes the summer of the northern inhabitants of the world longer than that of the southern inhabitants, shall be hereafter explained.

Since the noontide height of the Sun is least on the 22d, on this day he will be for the shortest time above our horizon: and from this time our days begin to increase, and our nights to diminish in length. We may observe, also, that the meridian height of the full Moon is this month much higher than it is in summer. In winter we have greater need of her light, and in winter we have more of it; and this is one among the manifold instances of the kindness of our benevolent Creater to the sons of men. All his works are founded in wisdom, and the more we examine them, the greater proofs do we find of his goodness. When the full Moon happens to be on the shortest day, then her meridian height is always nearly as great, and sometimes greater, than that of the noontide height of the Sun on the longest day in summer. This year the full Moon is on the 16th, and her meridian height is nearly three degrees greater than the greatest noontide height of the Sun.

On the 22d, also, the Earth's motion is the greatest; its rate of moving on this day being to its rate of moving on Midsummer day in the proportion nearly of two hundred and thirty-three to two hundred and twenty-three.

Formerly it was imagined, that the Earth stood still; that the Sun and Moon and Stars were whirled round it once in twenty-four hours; and that the Sun and Planets had besides another motion round the Earth, which was performed in different periods. For contradicting this vain imagination, Galileo, a wise Italian, was thrown into the dungeons of the Inquisition; and so miserably ignorant and wicked were the people of those days, that he was not pitied, because he dared to contradict, what every body said was the truth. But in this, as in every other case, we cannot be too much on our guard against what every body says. At one time every body said, that the Sun, and Moon, and Stars were to be worshipped, and they even cast their children into the fire, in honour of Moloch, or Saturn, the abominable object of their wicked superstition. At another time every body said, that crosses and images were to be worshipped, and they were burnt who did not follow that fashion. Prejudice is a quality, which makes men, otherwise of good dispositions, guilty of the wickedest actions. It is pardonable in a child to imagine, that the Sun turns round the Earth, and has an annual and a daily motion: it is weakness in a man to continue in his childish prejudices. Nature begins with the objects of sense; but gives opportunities of correcting its errors; thus teaching us, that the senses are only inlets to the mind, and that man should cultivate with the greatest attention his superior powers.

We may wonder now, that men could be so infatuated as to worship those things as gods, which perform with the greatest regularity their destined course, or are seen to remain immoveable with respect to each other in the heavens. A god, who eateth, or drinketh, or sleepeth, or is on a journey, merits the derision with which one of these miserable objects of man's folly was treated once by the holy prophet *. Yet, if the worship of the planets and stars has ceased to exist in the Christian world, a degrading superstition has survived its fall; and even men, professing the Christian religion, have been so strangely misled as to suppose, that the events of their life were guided by, or could be discovered from the motions and aspects of the heavenly bodies. Things without life, performing in the distant regions of

---

* Read the eighteenth chapter of the First Book of Kings. The narration and the speeches are not to be equalled in any thing in the whole scope of what is called classical literature.

space their allotted course, were made to have an influence on human affairs: and as at one time the flight of a bird and the barking of a dog, so in later days the flight of a meteor, and the position of the planets, were looked up to with awe and veneration.

Such folly cannot be too much stigmatised. By those, on whom the Sun of Righteousness has shone, how can it be entertained for a moment! The sacred volumes expose the folly in the strongest manner; and the philosopher of our own nation, who investigated nature with the firmest tread, properly concludes his researches by leading us to nature's God. "This "most elegant system," he says, "of the Sun, "Planets, Comets, and Stars, is under the domi-"nion of one alone, who governs all things, "not as the soul of the world, but as the Lord "of all. God is not affected by the motion of "bodies, nor do they feel any resistance from "his omnipresence. As a blind man has no "idea of colours, so we have no idea of the "manner in which God, allwise, perceives and "understands all things. We know him only "by his qualities and attributes, by his wisdom

" and goodness in the structure of all things: " we revere and worship him on account of his " power and dominion. For a god without " dominion and providence is nothing else but " fate and nature *."

During this month we have no planet above the horizon in the evening but Mercury, who, from setting so soon after the Sun, will probably afford us no opportunity of seeing him till towards the latter end of the month. In the five last days, and particularly the last day, if the sky is clear, we cannot fail of admiring his splendour.

On the 1st of this month the aspect of the heavens, about six o'clock, is the same as on the 8th of October at half past nine; about seven, the same as on the 16th of October at six minutes past ten: at half past eight, the same as on the 10th of November at ten: at half past nine, the same as the 20th of November at ten: and at half past ten nearly as follows:—

---

* See the Scholium at the end of Sir Isaac Newton's Principia, a scholium that is worthy of its great author.

On the meridian, near the zenith, the first of Perseus; and in the north, below mid-heaven, the four stars of the Lesser Bear; in the western hemisphere, in mid-heaven, near the meridian in the south, the first of the Whale.

In north-north-west, about twenty degrees above the horizon, the second and third of the Dragon: in north-west-by-north, the first of the Harp; about ten degrees above the horizon, in north-west-by-west, the Swan, the first star being nearly half way between mid-heaven and the horizon; and midway between the zenith and mid-heaven Cassiopeia. A line from the zenith to the west-by-south points out to us the third, second, and first of Andromeda, and the three stars of Pegasus. The first of Andromeda is in mid-heaven, and consequently the three stars of Pegasus, which, with this star, form a square, are below mid-heaven. In south-west-by-south, above mid-heaven, are the three stars of the Ram; and near the meridian the second of Perseus, with the small stars in the Medusa's head.

Near the meridian in the eastern hemisphere, and above mid-heaven, are the Pleiades, and consequently more to the east, and below them, Aldebaran and the Hyades. In south-east-by-south Orion spreads his glory, the first and third stars being near mid-heaven; and in the east, midway between the zenith and mid-heaven, Capella is distinguished from its superior lustre. The line drawn from it to the third of Orion points out in midway the second of the Bull. In the south-east Sirius again displays his power, and to the south of him is seen his companion, of far inferior brightness. The Lesser Dog is to the east of east-south-east, about the same height as the second of Orion; and above the Lesser Dog, in the east, we distinguish the two stars of the Twins; and consequently, by drawing a line from the first of Orion to the second of the Twins, we discover the third of the Twins. The first of the Lion, or the Lion's heart, is just rising near the east-north-east, and the Great Bear is in mid-heaven by the north-east-by-north.

In the fine evenings of this month, if the sky is very clear, you may pay some attention to a very curious appearance. You will perceive a streak, distinguished by an effulgence of a milk-white colour, which is hence called the

Milky-way. The Swan, Cassiopeia, and Perseus, are partly situated in it; and thence it passes between Capella and the second of the Bull, between the third of the Twins and the first of Orion, and very near to but to the east of Sirius. The nature of this singularity shall be examined, when we carry our researches farther into the structure of the heavens.

The Moon at its first appearance passes through the region of inferior stars. On the 6th, she is seen travelling towards the third and fourth of the Goat; and, on the 7th, she is very near to the lines connecting the second of the Water-bearer with these two stars, being nearer to the two stars than to the second. On the 8th, she is midway in the line between these two stars and the third of the Water-bearer, the first being about four degrees from the third, and known by its rather superior brightness. On the 9th, she is to the eastward of, but nearly in a line with the first and third of the Water-bearer, and also in a line with the first and second of Pegasus, and the first of the Southern Fish; with the latter she is upon the meridian at forty minutes past five. On the 10th, she is on the meridian at twenty-five minutes past six, being under the four stars in square of Pegasus and Andromeda; the first and second of Pegasus being in the eastern, and the third of Pegasus and the first of Andromeda in the western hemispheres. The third of the Fishes is now about six degrees from the Moon in the western hemisphere.

On the 11th, the Moon is on the meridian at twelve minutes past seven, having passed the four stars in square, which are now above her in the western hemisphere. She is evidently making her progress towards the three stars of the Ram, and she is near them on the 12th, at two minutes past eight, being then on the meridian, within less than a degree of the seventh of the Fishes, and about seven degrees from the third of the Ram. On the 13th, she is seen to the east of the three stars in the Ram, and is on the meridian at fifty-seven minutes past eight, being then about seven degrees from the first of the Ram. On the 14th, she approaches near to the Pleiades, of whom some suffer an occultation on the morning of the 15th. The seventh is then hid from our sight at thirty-nine minutes past two, and emerges at thirty minutes and a half past three. On the evening of this day the aspects of the heavens are as follow:—

At six, the same as on the 16th of October at six minutes past ten: at half past seven, the same as on the 10th of November at ten: at twenty minutes past eight, the same as on the 20th of November at ten: and at half past nine, the same as on the 1st of this month at half past ten.

On the 16th, the Moon is seen to have travelled from the Pleiades beyond the second of the Bull, from whom she is at her first appearance within the distance of four degrees, being midway nearly between the second of the Waggoner and the first of Orion. During the night she travels to the east of this line, and forms a splendid appearance over Orion. On the 17th, she has approached towards the two stars of the Twins, being, at her first appearance, nearly in the line between the first of the Twins and the first of Orion. On the 18th, she passes the two stars of the Twins, and, during the night, is seen in the same line with them. On the 19th, she rises near to the fourth of the Crab, as she passed under this star near four in the afternoon; and on the 20th she is seen very near to the fourteenth of the Lion, having passed within a degree of it near two in the afternoon: the star beneath the Moon and this fourteenth is the fifteenth of the Lion: the first, or heart of the Lion, being about seven degrees from the Moon. On the 21st, she rises below the first of the Lion, about six degrees from it; and on the 22d the heavens, at ten o'clock in the evening, present the following objects to our view: —

The Pleiades and Aldebaran are near the meridian; the Pleiades in the western hemisphere, about twenty degrees above mid-heaven; and Aldebaran in the eastern, within ten degrees of mid-heaven; and about half way between mid-heaven and the horizon the third of the River is on the meridian; a little below mid-heaven in the north are the four stars of the Lesser Bear.

To the west of north-by-west, near the horizon, the second and third stars of the Dragon; the Harp is below them near the north-west-by-north; the second of the Swan is in the hori zon in the north-west; and, of course, the whole of the constellation is below mid-heaven; and in the same direction above mid-heaven is Cassiopeia's Chair. A line, drawn from the zenith between west and west-by-north, passes near the first of Perseus, within six degrees of the zenith, the third, second, and first of Andromeda, and the first of Pegasus. The first of Andromeda is rather below mid-heaven, and consequently the four stars in square of Pegasus and Andromeda are below mid-heaven; the second of Pegasus being to the north, and the third of Pegasus to the south of the line joining the first of Pegasus to the first of Andromeda. The three stars of the Ram are just above mid-heaven in the south-west: in the same direction, but near to the zenith, is the second of Perseus, with the stars in the Medusa's head. In the south-south-west, below mid-heaven, is the first star of the Whale. About ten degrees below the zenith, and very near to the meridian, is the fifth of Perseus; and midway between this star and the Pleiades the sixth of Perseus.

In the eastern hemisphere Orion gratifies us by his brilliancy in the south-south-east, and in the south-east-by-south below him we recognise Sirius and his companion, Sirius being to the east, and his companion, the second of the Great Dog, on the south of the line; and below them, near the horizon to the south of south-east, is the fourth of the Great Dog. A line drawn from the zenith to south-east-by-east points out to us Capella and his companions near the zenith, the third of the Twins below mid-heaven, and below this star, and more to the east, the two first stars of the Lesser Dog. The two first stars of the Twins are in mid-heaven to the south of east, and the first of the Lion is near the horizon in east-by-north, the third is above it more to the east, and the fourth at the same height above the horizon as the first, to the east of east-north-east. The Great Bear is below mid-heaven to the north of north-east; and to the north of the line, produced from the first through the third of the Great Bear, is a bright star, about ten degrees above the horizon, which is called Charles's heart.

The aspects of the earlier part of the evening may be easily derived from those given for the 15th, or they may be corrected by those which take place on the 31st, which are as follow: —

At five, the same as on the 16th of October at six minutes past ten: at a quarter past six, the same as on the 10th of November at ten; at a quarter past seven, the same as on the 20th of November at ten: at half past eight, the same as on the 1st of this month at half past ten: at twenty minutes past nine, the same as on the 22d at ten; and at twenty minutes past ten, the heavens present the following objects:—

On the meridian, Capella near the zenith, and the second of Orion below mid-heaven. Midway between the zenith and mid-heaven, near the meridian in the eastern hemisphere, is the second of the Bull; and below it in the western hemisphere, and farther from the meridian, Aldebaran and the Hyades. The two stars of the Dragon are near the meridian, and within fifteen degrees of the horizon in the western hemisphere.

The first of the Harp is now close almost to the horizon to the west of north-by-west: the second of the Swan has just set in north-west-by-north, and the first is consequently within twenty degrees of the horizon. Cassiopeia is above mid-heaven to the west of north-west. A line drawn from the zenith to the west-by-north points out to our notice the first of Perseus, and the three stars in Andromeda, and the three in Pegasus. The four stars in square being below mid-heaven, and one of them, the first of Pegasus, within ten degrees of the horizon. The first of the Ram is now in mid-heaven in the west-south-west, the second of Perseus being midway between it and the zenith. A line, drawn from the zenith to the south-west, passes the Pleiades near mid-heaven, and the first of the Whale almost midway between them and the horizon.

In the eastern hemisphere Orion extends from the meridian to south-by-east. Sirius is below him in the south-south-east, the second star of the Great Dog being nearly to the west of him, the third star at the same distance to the east, and the fourth star below the first and third, but nearest to the horizon. In the south-east below mid-heaven is the Lesser Dog, and in south-east-by-east above it, are the two stars of the Twins in mid-heaven. To the south of east-south-east is the first of the Hydra near the horizon, and in the east the constellation of the

Lion is to be distinguished; the first or Lion's heart being to the east of east-by-south, and lower down, to the east of east-north-east, the second; above the second, nearly in east-by-north, is the fourth; and in the east, above the line joining the first and fourth, is the third. In mid-heaven, in north-east-by-north, is the Greater Bear, and midway between the third star and the horizon is Charles's Heart.

Thus conclude our travels in the upper regions of space for the present year; and, before you enter upon another course, your mind will naturally expand itself from the contemplation of created objects, to the power of him who called them into existence, and regulates their motions with the utmost exactness. The few that have been pointed out particularly to your observation have led you probably to consider how few stars there are that present themselves in general on any night to our view: but what we do see bear no proportion to the number which remains unseen. Between every two stars that you behold are myriads without the reach of our perception, and myriads remain still farther behind them, all peopled with various beings, capable of enjoying the munificence of their Creater. Well, then, may we say with the holy songster upon the same occasion, "What is mortal man, O God, that thou hast him in remembrance: or a son of him, who sprang from the dust, that thou regardest him?"

QUESTIONS.

PAGE

WHAT part of a circle is a degree? 6

By what object, and how can you determine a degree in the heavens? 6

How many points are there in the compass? 40

How many degrees are there in each point of the compass? 40

At what point of the compass is the Sun in this country always at noon? 4

At what part of the Earth do the Sun and Stars, when visible, appear in the course of

	PAGE
twenty-four hours in every point of the compass?	120
When is the Sun nearest to us, in summer or in winter?	165
Why is it hotter in summer than in winter?	165
Why is not that the hottest or the coldest month, when the Sun is the longest or the shortest time above the horizon?	88
What is the greatest difference between the mid-day height of the Sun in summer and that in winter?	165
When is the Moon highest above our horizon, in summer or in winter?	167
At what part of the Earth are most stars to be seen?	120
At what part of the Earth are fewest stars to be seen?	120

PAGE

In what part of the Earth do the Sun, Moon, and Planets appear at times in the zenith? 120

In what part of the Earth do the Sun, Moon, and Planets, when visible, appear always near the horizon? 120

In what parts of the Earth are the days and nights always equal? 120

Why is a Star, which is hidden from some persons' view by the Moon, visible at the same time to other persons? 54, 55

How is the latitude of a place to be discovered by the height of the polar star at night, or by the height of the Sun at noon? 135

Why do the inhabitants at the north or south poles see the face of the Sun for more than six months?................................ 115

What do you mean by zenith?........... 4

What do you mean by the horizon?...... 3

PAGE

What do you mean by the meridian? 5

In what part of the Earth is a person, who sees the polar star thirty degrees high at eleven o'clock at night, when it is five o'clock in the morning with us? 135, 136

THE END.

CHARLES WOOD, Printer,
Poppin's Court, Fleet Street, London.

3 9015 06228 6458

12
47
1344

A 415431 DUPL